SEQUENCE LISTING

<110> THE GOVERNMENT OF THE UNITED STATES OF AMERICA AS
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<120> RECOMBINANT HUMAN METAPNEUMOVIRUS AND ITS USE

<130> 4239-67784

<150> US 60/451,119
<151> 2003-02-28

<150> US 60/478,667
<151> 2003-06-13

<160> 36

<170> PatentIn version 3.2

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15

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16

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17

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18

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21

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22

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23

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atatttttaaa ttctccaaag ggcgaattaa attatgattt ttttgaagca ttggagaaca   13800

cttaccctaa tatgattaaa ctaatagata acttagggaa tgcagagatt aaaaaactga   13860

tcaaagtaac aggatacatg cttgtaagta aaaatgaaa aatgatgaag atgacaaaat   13920

agatgacaac ttcatactat tctaaattaa ttatttgatt atgcaattat atgatagtta   13980

attaaaatta aaaattaaaa atcaaaagtt aaaatttaaa acctatcatt aagtttatta   14040

aaaataagaa attataattg aatgtatacg gttttttttgc cgt   14083

<210>   4
<211>   187
<212>   PRT
<213>   human metapneumovirus

<400>   4

Met Ser Arg Lys Ala Pro Cys Lys Tyr Glu Val Arg Gly Lys Cys Asn
1   5   10   15

Arg Gly Ser Glu Cys Lys Phe Asn His Asn Tyr Trp Ser Trp Pro Asp
                20   25   30

Arg Tyr Leu Leu Ile Arg Ser Asn Tyr Leu Leu Asn Gln Leu Leu Arg
            35   40   45

Asn Thr Asp Arg Ala Asp Gly Leu Ser Ile Ile Ser Gly Ala Gly Arg
        50   55   60

Glu Asp Arg Thr Gln Asp Phe Val Leu Gly Ser Thr Asn Val Val Gln
65   70   75   80

Gly Tyr Ile Asp Asp Asn Gln Ser Ile Thr Lys Ala Ala Ala Cys Tyr
                85   90   95

24

Ser Leu His Asn Ile Ile Lys Gln Leu Gln Glu Val Glu Val Arg Gln
            100   105   110

Ala Arg Asp Ser Lys Leu Ser Asp Ser Lys His Val Ala Leu His Asn
            115   120   125

Leu Ile Leu Ser Tyr Met Glu Met Ser Lys Thr Pro Ala Ser Leu Ile
        130   135   140

Asn Asn Leu Lys Arg Leu Pro Arg Glu Lys Leu Lys Lys Leu Ala Lys
145   150   155   160

Leu Ile Ile Asp Leu Ser Ala Gly Ala Asp Asn Asp Ser Ser Tyr Ala
                165   170   175

Leu Gln Asp Ser Glu Ser Ile Asn Gln Val Gln
            180   185

<210>   5
<211>   179
<212>   PRT
<213>   human metapneumovirus

<400>   5

Met Ile Thr Leu Asp Val Ile Lys Ser Asp Gly Ser Ser Lys Thr Cys
1   5   10   15

Thr His Leu Lys Lys Ile Ile Lys Asp His Ser Gly Lys Val Leu Ile
            20   25   30

Ala Leu Lys Leu Ile Leu Ala Leu Leu Thr Phe Phe Thr Ile Thr Ile
            35   40   45

Thr Ile Asn Tyr Ile Lys Val Glu Asn Asn Leu Gln Ile Cys Gln Ser
    50   55   60

Lys Thr Glu Ser Asp Lys Glu Asp Ser Pro Ser Asn Thr Thr Ser Val
65   70   75   80

Thr Thr Lys Thr Thr Leu Asp His Asp Ile Thr Gln Tyr Phe Lys Arg
            85   90   95

Leu Ile Gln Arg Tyr Thr Asp Ser Val Ile Asn Lys Asp Thr Cys Trp
        100   105   110

Lys Ile Ser Arg Asn Gln Cys Thr Asn Ile Thr Thr Tyr Lys Phe Leu
                                25

Cys Phe Lys Pro Glu Asp Ser Lys Ile Asn Ser Cys Asp Arg Leu Thr
    130   135   140

Asp Leu Cys Arg Asn Lys Ser Lys Ser Ala Ala Glu Ala Tyr His Thr
145   150   155   160

Val Glu Cys His Cys Ile Tyr Thr Ile Glu Trp Lys Cys Tyr His His
                165   170   175

Ser Ile Asp

<210>   6
<211>   219
<212>   PRT
<213>   human metapneumovirus

<400>   6

Met Glu Val Lys Val Glu Asn Ile Arg Ala Ile Asp Met Leu Lys Ala
1   5   10   15

Arg Val Lys Asn Arg Val Ala Arg Ser Lys Cys Phe Lys Asn Ala Ser
            20   25   30

Leu Ile Leu Ile Gly Ile Thr Thr Leu Ser Ile Ala Leu Asn Ile Tyr
            35   40   45

Leu Ile Ile Asn Tyr Thr Ile Gln Lys Thr Ser Ser Glu Ser Glu His
        50   55   60

His Thr Ser Ser Pro Pro Thr Glu Ser Asn Lys Glu Ala Ser Thr Ile
65   70   75   80

Ser Thr Asp Asn Pro Asp Ile Asn Pro Asn Ser Gln His Pro Thr Gln
                85   90   95

Gln Ser Thr Glu Asn Pro Thr Leu Asn Pro Ala Ala Ser Val Ser Pro
            100   105   110

Ser Glu Thr Glu Pro Ala Ser Thr Pro Asp Thr Thr Asn Arg Leu Ser
            115   120   125

Ser Val Asp Arg Ser Thr Ala Gln Pro Ser Glu Ser Arg Thr Lys Thr
        130   135   140

26

Lys Pro Thr Val His Thr Arg Asn Asn Pro Ser Thr Ala Ser Ser Thr
145   150   155   160

Gln Ser Pro Pro Arg Ala Thr Thr Lys Ala Ile Arg Arg Ala Thr Thr
              165   170   175

Phe Arg Met Ser Ser Thr Gly Lys Arg Pro Thr Thr Thr Ser Val Gln
              180   185   190

Ser Asp Ser Ser Thr Thr Thr Gln Asn His Glu Glu Thr Gly Ser Ala
              195   200   205

Asn Pro Gln Ala Ser Val Ser Thr Met Gln Asn
    210   215

<210>   7
<211>   2005
<212>   PRT
<213>   human metapneumovirus

<400>   7

Met Asp Pro Leu Asn Glu Ser Thr Val Asn Val Tyr Leu Pro Asp Ser
1   5   10   15

Tyr Leu Lys Gly Val Ile Ser Phe Ser Glu Thr Asn Ala Ile Gly Ser
              20   25   30

Cys Leu Leu Lys Arg Pro Tyr Leu Lys Asn Asp Asn Thr Ala Lys Val
              35   40   45

Ala Ile Glu Asn Pro Val Ile Glu His Val Arg Leu Lys Asn Ala Val
    50   55   60

Asn Ser Lys Met Lys Ile Ser Asp Tyr Lys Val Val Glu Pro Val Asn
65   70   75   80

Met Gln His Glu Ile Met Lys Asn Val His Ser Cys Glu Leu Thr Leu
              85   90   95

Leu Lys Gln Phe Leu Thr Arg Ser Lys Asn Ile Ser Thr Leu Lys Leu
              100   105   110

Asn Met Ile Cys Asp Trp Leu Gln Leu Lys Ser Thr Ser Asp Asp Thr
              115   120   125

27

Ser Ile Leu Ser Phe Ile Asp Val Glu Phe Ile Pro Ser Trp Val Ser
    130   135   140

Asn Trp Phe Ser Asn Trp Tyr Asn Leu Asn Lys Leu Ile Leu Glu Phe
145   150   155   160

Arg Arg Glu Glu Val Ile Arg Thr Gly Ser Ile Leu Cys Arg Ser Leu
                165   170   175

Gly Lys Leu Val Phe Ile Val Ser Ser Tyr Gly Cys Ile Val Lys Ser
                180   185   190

Asn Lys Ser Lys Arg Val Ser Phe Phe Thr Tyr Asn Gln Leu Leu Thr
        195   200   205

Trp Lys Asp Val Met Leu Ser Arg Phe Asn Ala Asn Phe Cys Ile Trp
    210   215   220

Val Ser Asn Ser Leu Asn Glu Asn Gln Glu Gly Leu Gly Leu Arg Ser
225   230   235   240

Asn Leu Gln Gly Met Leu Thr Asn Lys Leu Tyr Glu Thr Val Asp Tyr
                245   250   255

Met Leu Ser Leu Cys Cys Asn Glu Gly Phe Ser Leu Val Lys Glu Phe
            260   265   270

Glu Gly Phe Ile Met Ser Glu Ile Leu Arg Ile Thr Glu His Ala Gln
        275   280   285

Phe Ser Thr Arg Phe Arg Asn Thr Leu Leu Asn Gly Leu Thr Asp Gln
    290   295   300

Leu Thr Lys Leu Lys Asn Lys Asn Arg Leu Arg Val His Ser Thr Val
305   310   315   320

Leu Glu Asn Asn Asp Tyr Pro Met Tyr Glu Val Val Leu Lys Leu Leu
                325   330   335

Gly Asp Thr Leu Arg Cys Ile Lys Leu Leu Ile Asn Lys Asn Leu Glu
            340   345   350

Asn Ala Ala Glu Leu Tyr Tyr Ile Phe Arg Ile Phe Gly His Pro Met
        355   360   365

28

Val Asp Glu Arg Asp Ala Met Asp Ala Val Lys Leu Asn Asn Glu Ile
    370   375   380

Thr Lys Ile Leu Arg Leu Glu Ser Leu Thr Glu Leu Arg Gly Ala Phe
385   390   395   400

Ile Leu Arg Ile Ile Lys Gly Phe Val Asp Asn Asn Lys Arg Trp Pro
            405   410   415

Lys Ile Lys Asn Leu Lys Val Leu Ser Lys Arg Trp Thr Met Tyr Phe
            420   425   430

Lys Ala Lys Asn Tyr Pro Ser Gln Leu Glu Leu Ser Glu Gln Asp Phe
        435   440   445

Leu Glu Leu Ala Ala Ile Gln Phe Glu Gln Glu Phe Ser Val Pro Glu
    450   455   460

Lys Thr Asn Leu Glu Met Val Leu Asn Asp Lys Ala Ile Ser Pro Pro
465   470   475   480

Lys Arg Leu Ile Trp Ser Val Tyr Pro Lys Asn Tyr Leu Pro Glu Thr
            485   490   495

Ile Lys Asn Arg Tyr Leu Glu Glu Thr Phe Asn Ala Ser Asp Ser Leu
        500   505   510

Lys Thr Arg Arg Val Leu Glu Tyr Tyr Leu Lys Asp Asn Lys Phe Asp
        515   520   525

Gln Lys Glu Leu Lys Ser Tyr Val Val Arg Gln Glu Tyr Leu Asn Asp
    530   535   540

Lys Glu His Ile Val Ser Leu Thr Gly Lys Glu Arg Glu Leu Ser Val
545   550   555   560

Gly Arg Met Phe Ala Met Gln Pro Gly Lys Gln Arg Gln Ile Gln Ile
            565   570   575

Leu Ala Glu Lys Leu Leu Ala Asp Asn Ile Val Pro Phe Phe Pro Glu
            580   585   590

Thr Leu Thr Lys Tyr Gly Asp Leu Asp Leu Gln Arg Ile Met Glu Ile
        595   600   605

29

Lys Ser Glu Leu Ser Ser Ile Lys Thr Arg Arg Asn Asp Ser Tyr Asn
    610   615   620

Asn Tyr Ile Ala Arg Ala Ser Ile Val Thr Asp Leu Ser Lys Phe Asn
625   630   635   640

Gln Ala Phe Arg Tyr Glu Thr Thr Ala Ile Cys Ala Asp Val Ala Asp
            645   650   655

Glu Leu His Gly Thr Gln Ser Leu Phe Cys Trp Leu His Leu Ile Val
            660   665   670

Pro Met Thr Thr Met Ile Cys Ala Tyr Arg His Ala Pro Pro Glu Thr
        675   680   685

Lys Gly Glu Tyr Asp Ile Asp Lys Ile Glu Glu Gln Ser Gly Leu Tyr
    690   695   700

Arg Tyr His Met Gly Gly Ile Glu Gly Trp Cys Gln Lys Leu Trp Thr
705   710   715   720

Met Glu Ala Ile Ser Leu Leu Asp Val Val Ser Val Lys Thr Arg Cys
                725   730   735

Gln Met Thr Ser Leu Leu Asn Gly Asp Asn Gln Ser Ile Asp Val Ser
            740   745   750

Lys Pro Val Lys Leu Ser Glu Gly Leu Asp Glu Val Lys Ala Asp Tyr
            755   760   765

Arg Leu Ala Val Lys Met Leu Lys Glu Ile Arg Asp Ala Tyr Arg Asn
    770   775   780

Ile Gly His Lys Leu Lys Glu Gly Glu Thr Tyr Ile Ser Arg Asp Leu
785   790   795   800

Gln Phe Ile Ser Lys Val Ile Gln Ser Glu Gly Val Met His Pro Thr
                805   810   815

Pro Ile Lys Lys Val Leu Arg Val Gly Pro Trp Ile Asn Thr Ile Leu
            820   825   830

Asp Asp Ile Lys Thr Ser Ala Glu Ser Ile Gly Ser Leu Cys Gln Glu
            835   840   845

30

Leu Glu Phe Arg Gly Glu Ser Ile Ile Val Ser Leu Ile Leu Arg Asn
   850   855   860

Phe Trp Leu Tyr Asn Leu Tyr Met His Glu Ser Lys Gln His Pro Leu
865   870   875   880

Ala Gly Lys Gln Leu Phe Lys Gln Leu Asn Lys Thr Leu Thr Ser Val
         885   890   895

Gln Arg Phe Phe Glu Ile Lys Arg Glu Asn Glu Val Val Asp Leu Trp
       900   905   910

Met Asn Ile Pro Met Gln Phe Gly Gly Gly Asp Pro Val Val Phe Tyr
      915   920   925

Arg Ser Phe Tyr Arg Arg Thr Pro Asp Phe Leu Thr Glu Ala Ile Ser
    930   935   940

His Val Asp Ile Leu Leu Lys Ile Ser Ala Asn Ile Lys Asn Glu Thr
945   950   955   960

Lys Val Ser Phe Phe Lys Ala Leu Leu Ser Ile Glu Lys Asn Glu Arg
         965   970   975

Ala Thr Leu Thr Thr Leu Met Arg Asp Pro Gln Ala Val Gly Ser Glu
        980   985   990

Arg Gln Ala Lys Val Thr Ser Asp Ile Asn Arg Thr Ala Val Thr Ser
    995   1000   1005

Ile Leu Ser Leu Ser Pro Asn Gln Leu Phe Ser Asp Ser Ala Ile
   1010   1015   1020

His Tyr Ser Arg Asn Glu Glu Glu Val Gly Ile Ile Ala Glu Asn
   1025   1030   1035

Ile Thr Pro Val Tyr Pro His Gly Leu Arg Val Leu Tyr Glu Ser
   1040   1045   1050

Leu Pro Phe His Lys Ala Glu Lys Val Val Asn Met Ile Ser Gly
   1055   1060   1065

Thr Lys Ser Ile Thr Asn Leu Leu Gln Arg Thr Ser Ala Ile Asn
   1070   1075   1080

31

Gly Glu Asp Ile Asp Arg Ala Val Ser Met Met Leu Glu Asn Leu
    1085   1090   1095

Gly Leu Leu Ser Arg Ile Leu Ser Val Val Val Asp Ser Ile Glu
    1100   1105   1110

Ile Pro Ile Lys Ser Asn Gly Arg Leu Ile Cys Cys Gln Ile Ser
    1115   1120   1125

Arg Thr Leu Arg Glu Thr Ser Trp Asn Asn Met Glu Ile Val Gly
    1130   1135   1140

Val Thr Ser Pro Ser Ile Thr Thr Cys Met Asp Val Ile Tyr Ala
    1145   1150   1155

Thr Ser Ser His Leu Lys Gly Ile Ile Ile Glu Lys Phe Ser Thr
    1160   1165   1170

Asp Arg Thr Thr Arg Gly Gln Arg Gly Pro Lys Ser Pro Trp Val
    1175   1180   1185

Gly Ser Ser Thr Gln Glu Lys Lys Leu Val Pro Val Tyr Asn Arg
    1190   1195   1200

Gln Ile Leu Ser Lys Gln Gln Arg Glu Gln Leu Glu Ala Ile Gly
    1205   1210   1215

Lys Met Arg Trp Val Tyr Lys Gly Thr Pro Gly Leu Arg Arg Leu
    1220   1225   1230

Leu Asn Lys Ile Cys Leu Gly Ser Leu Gly Ile Ser Tyr Lys Cys
    1235   1240   1245

Val Lys Pro Leu Leu Pro Arg Phe Met Ser Val Asn Phe Leu His
    1250   1255   1260

Arg Leu Ser Val Ser Ser Arg Pro Met Glu Phe Pro Ala Ser Val
    1265   1270   1275

Pro Ala Tyr Arg Thr Thr Asn Tyr His Phe Asp Thr Ser Pro Ile
    1280   1285   1290

Asn Gln Ala Leu Ser Glu Arg Phe Gly Asn Glu Asp Ile Asn Leu
    1295   1300   1305

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Val Phe  Gln Asn Ala Ile Ser  Cys Gly Ile Ser Ile  Met Ser Val
    1310              1315              1320

Val Glu  Gln Leu Thr Gly Arg  Ser Pro Lys Gln Leu  Val Leu Ile
    1325              1330              1335

Pro Gln  Leu Glu Glu Ile Asp  Ile Met Pro Pro Pro  Val Phe Gln
    1340              1345              1350

Gly Lys  Phe Asn Tyr Lys Leu  Val Asp Lys Ile Thr  Ser Asp Gln
    1355              1360              1365

His Ile  Phe Ser Pro Asp Lys  Ile Asp Met Leu Thr  Leu Gly Lys
    1370              1375              1380

Met Leu  Met Pro Thr Ile Lys  Gly Gln Lys Thr Asp  Gln Phe Leu
    1385              1390              1395

Asn Lys  Arg Glu Asn Tyr Phe  His Gly Asn Asn Leu  Ile Glu Ser
     1400              1405              1410

Leu Ser  Ala Ala Leu Ala Cys  His Trp Cys Gly Ile  Leu Thr Glu
    1415              1420              1425

Gln Cys  Ile Glu Asn Asn Ile  Phe Lys Lys Asp Trp  Gly Asp Gly
    1430              1435              1440

Phe Ile  Ser Asp His Ala Phe  Met Asp Phe Lys Ile  Phe Leu Cys
    1445              1450              1455

Val Phe  Lys Thr Lys Leu Leu  Cys Ser Trp Gly Ser  Gln Gly Lys
    1460              1465              1470

Asn Ile  Lys Asp Glu Asp Ile  Val Asp Glu Ser Ile  Asp Lys Leu
    1475              1480              1485

Leu Arg  Ile Asp Asn Thr Phe  Trp Arg Met Phe Ser  Lys Val Met
    1490              1495              1500

Phe Glu  Pro Lys Val Lys Lys  Arg Ile Met Leu Tyr  Asp Val Lys
    1505              1510              1515

Phe Leu  Ser Leu Val Gly Tyr  Ile Gly Phe Lys Asn  Trp Phe Ile
    1520              1525              1530
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33

Glu Gln Leu Arg Ser Ala Glu Leu His Glu Ile Pro Trp Ile Val
    1535   1540   1545

Asn Ala Glu Gly Asp Leu Val Glu Ile Lys Ser Ile Lys Ile Tyr
    1550   1555   1560

Leu Gln Leu Ile Glu Gln Ser Leu Phe Leu Arg Ile Thr Val Leu
    1565   1570   1575

Asn Tyr Thr Asp Met Ala His Ala Leu Thr Arg Leu Ile Arg Lys
    1580   1585   1590

Lys Leu Met Cys Asp Asn Ala Leu Leu Thr Pro Ile Ser Ser Pro
    1595   1600   1605

Met Val Asn Leu Thr Gln Val Ile Asp Pro Thr Thr Gln Leu Asp
    1610   1615   1620

Tyr Phe Pro Lys Ile Thr Phe Glu Arg Leu Lys Asn Tyr Asp Thr
    1625   1630   1635

Ser Ser Asn Tyr Ala Lys Gly Lys Leu Thr Arg Asn Tyr Met Ile
    1640   1645   1650

Leu Leu Pro Trp Gln His Val Asn Arg Tyr Asn Phe Val Phe Ser
    1655   1660   1665

Ser Thr Gly Cys Lys Val Ser Leu Lys Thr Cys Ile Gly Lys Leu
    1670   1675   1680

Met Lys Asp Leu Asn Pro Lys Val Leu Tyr Phe Ile Gly Glu Gly
    1685   1690   1695

Ala Gly Asn Trp Met Ala Arg Thr Ala Cys Glu Tyr Pro Asp Ile
    1700   1705   1710

Lys Phe Val Tyr Arg Ser Leu Lys Asp Asp Leu Asp His His Tyr
    1715   1720   1725

Pro Leu Glu Tyr Gln Arg Val Ile Gly Glu Leu Ser Arg Ile Ile
    1730   1735   1740

Asp Ser Gly Glu Gly Leu Ser Met Glu Thr Thr Asp Ala Thr Gln
    1745   1750   1755

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Lys Thr  His Trp Asp Leu Ile  His Arg Val Ser Lys  Asp Ala Leu
    1760               1765              1770

Leu Ile  Thr Leu Cys Asp Ala  Glu Phe Lys Asp Arg  Asp Asp Phe
    1775               1780              1785

Phe Lys  Met Val Ile Leu Trp  Arg Lys His Val Leu  Ser Cys Arg
    1790               1795              1800

Ile Cys  Thr Thr Tyr Gly Thr  Asp Leu Tyr Leu Phe  Ala Lys Tyr
    1805               1810              1815

His Ala  Lys Asp Cys Asn Val  Lys Leu Pro Phe Phe  Val Arg Ser
    1820               1825              1830

Val Ala  Thr Phe Ile Met Gln  Gly Ser Lys Leu Ser  Gly Ser Glu
    1835               1840              1845

Cys Tyr  Ile Leu Leu Thr Leu  Gly His His Asn Ser  Leu Pro Cys
    1850               1855              1860

His Gly  Glu Ile Gln Asn Ser  Lys Met Lys Ile Ala  Val Cys Asn
    1865               1870              1875

Asp Phe  Tyr Ala Ala Lys Lys  Leu Asp Asn Lys Ser  Ile Glu Ala
    1880               1885              1890

Asn Cys  Lys Ser Leu Leu Ser  Gly Leu Arg Ile Pro  Ile Asn Lys
    1895               1900              1905

Lys Glu  Leu Asp Arg Gln Arg  Arg Leu Leu Thr Leu  Gln Ser Asn
    1910               1915              1920

His Ser  Ser Val Ala Thr Val  Gly Gly Ser Lys Ile  Ile Glu Ser
    1925               1930              1935

Lys Trp  Leu Thr Asn Lys Ala  Ser Thr Ile Ile Asp  Trp Leu Glu
    1940               1945              1950

His Ile  Leu Asn Ser Pro Lys  Gly Glu Leu Asn Tyr  Asp Phe Phe
    1955               1960              1965

Glu Ala  Leu Glu Asn Thr Tyr  Pro Asn Met Ile Lys  Leu Ile Asp
    1970               1975              1980

                              35
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Asn Leu Gly Asn Ala Glu Ile Lys Lys Leu Ile Lys Val Thr Gly
    1985   1990   1995

Tyr Met Leu Val Ser Lys Lys
    2000   2005

<210> 8
<211> 177
<212> PRT
<213> human metapneumovirus

<400> 8

Met Lys Thr Leu Asp Val Ile Lys Ser Asp Gly Ser Ser Glu Thr Cys
1   5   10   15

Asn Gln Leu Lys Lys Ile Ile Lys Lys His Ser Gly Lys Leu Leu Ile
            20   25   30

Ala Ser Lys Pro Thr Leu Ala Leu Leu Thr Ser Phe Thr Val Thr Ile
        35   40   45

Thr Val Asn Tyr Thr Lys Val Glu Asn Asn Leu Gln Ala Cys Gln Leu
    50   55   60

Lys Asn Glu Ser Asp Lys Lys Asp Thr Lys Leu Asn Thr Thr Ser Thr
65   70   75   80

Thr Ile Arg Pro Ile Pro Asp Leu Asn Ala Val Gln Tyr Leu Lys Arg
            85   90   95

Leu Ile Gln Lys His Thr Asn Ser Val Thr Lys Asp Arg Asp Thr Cys
            100   105   110

Trp Arg Ile His Thr Asn Gln Cys Thr Asn Ile Lys Ile Tyr Lys Phe
            115   120   125

Leu Cys Phe Gly Ser Met Asn Ser Thr Asn Thr Asp Cys Glu Glu Pro
    130   135   140

Thr Val Leu Cys Asp Lys Lys Ser Lys Thr Met Thr Glu Lys His Arg
145   150   155   160

Lys Ala Glu Cys His Arg Pro His Thr Thr Glu Trp Trp Cys His Tyr
            165   170   175

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Leu

<210> 9
<211> 236
<212> PRT
<213> human metapneumovirus

<400> 9

Met Glu Ala Arg Val Glu Asn Ile Arg Ala Ile Asp Met Phe Lys Ala
1   5   10   15

Lys Met Lys Asn Arg Ile Arg Ser Ser Lys Cys His Arg Asn Ala Thr
            20   25   30

Leu Ile Leu Ile Gly Ser Thr Ala Pro Ser Met Ala Leu Asn Thr Leu
            35   40   45

Leu Ile Ile Asp His Ala Thr Ser Lys Asn Met Thr Lys Val Glu His
        50   55   60

Cys Val Asn Met Pro Pro Val Glu Pro Ser Lys Lys Thr Pro Met Thr
65   70   75   80

Ser Ala Ala Asp Pro Asn Thr Lys Pro Asn Pro Gln Gln Ala Thr Gln
                85   90   95

Leu Thr Thr Glu Asp Ser Thr Ser Leu Ala Ala Thr Leu Glu Asp His
                100   105   110

Leu His Thr Gly Thr Thr Pro Thr Pro Asp Ala Thr Val Ser Gln Gln
            115   120   125

Thr Thr Asp Glu His Thr Thr Leu Leu Arg Ser Thr Asn Arg Gln Thr
        130   135   140

Thr Gln Thr Thr Ala Glu Lys Lys Pro Thr Arg Ala Thr Thr Lys Lys
145   150   155   160

Glu Thr Thr Thr Arg Thr Thr Ser Thr Ala Ala Thr Gln Thr Leu Asn
                165   170   175

Thr Thr Asn Gln Thr Ser Asn Gly Arg Glu Ala Thr Thr Thr Ser Ala
            180   185   190

Arg Ser Arg Asn Asn Ala Thr Thr Gln Ser Ser Asp Gln Thr Thr Gln

37

Ala Ala Asp Pro Ser Ser Gln Ser Gln His Thr Gln Lys Ser Thr Thr
210 215 220

Thr Thr His Asn Thr Asp Thr Ser Ser Pro Ser Ser
225 230 235

<210> 10
<211> 183
<212> PRT
<213> human metapneumovirus

<400> 10

Met Ile Thr Leu Asp Val Ile Lys Ser Asp Gly Ser Ser Lys Thr Cys
1 5 10 15

Thr His Leu Lys Lys Ile Ile Lys Asp His Ser Gly Lys Val Leu Ile
20 25 30

Val Leu Lys Leu Ile Leu Ala Leu Leu Thr Phe Leu Thr Val Thr Ile
35 40 45

Thr Ile Asn Tyr Ile Lys Val Glu Asn Asn Leu Gln Ile Cys Gln Ser
50 55 60

Lys Thr Glu Ser Asp Lys Lys Asp Ser Ser Ser Asn Thr Thr Ser Val
65 70 75 80

Thr Thr Lys Thr Thr Leu Asn His Asp Ile Thr Gln Tyr Phe Lys Ser
85 90 95

Leu Ile Gln Arg Tyr Thr Asn Ser Ala Ile Asn Ser Asp Thr Cys Trp
100 105 110

Lys Ile Asn Arg Asn Gln Cys Thr Asn Ile Thr Thr Tyr Lys Phe Leu
115 120 125

Cys Phe Lys Ser Glu Asp Thr Lys Thr Asn Asn Cys Asp Lys Leu Thr
130 135 140

Asp Leu Cys Arg Asn Lys Pro Lys Pro Ala Val Gly Val Tyr His Ile
145 150 155 160

Val Glu Cys His Cys Ile Tyr Thr Val Lys Trp Lys Cys Tyr His Tyr
165 170 175

38

Pro Thr Asp Glu Thr Gln Ser
            180

<210> 11
<211> 236
<212> PRT
<213> human metapneumovirus

<400> 11

Met Glu Val Lys Val Glu Asn Ile Arg Thr Ile Asp Met Leu Lys Ala
1   5   10   15

Arg Val Lys Asn Arg Val Ala Arg Ser Lys Cys Phe Lys Asn Ala Ser
            20   25   30

Leu Val Leu Ile Gly Ile Thr Thr Leu Ser Ile Ala Leu Asn Ile Tyr
            35   40   45

Leu Ile Ile Asn Tyr Lys Met Gln Lys Asn Thr Ser Glu Ser Glu His
    50   55   60

His Thr Ser Ser Ser Pro Met Glu Ser Ser Arg Glu Thr Pro Thr Val
65   70   75   80

Pro Thr Asp Asn Ser Asp Thr Asn Ser Ser Pro Gln His Pro Thr Gln
            85   90   95

Gln Ser Thr Glu Gly Ser Thr Leu Tyr Phe Ala Ala Ser Ala Ser Ser
            100   105   110

Pro Glu Thr Glu Pro Thr Ser Thr Pro Asp Thr Thr Asn Arg Pro Pro
            115   120   125

Phe Val Asp Thr His Thr Thr Pro Pro Ser Ala Ser Arg Thr Lys Thr
    130   135   140

Ser Pro Ala Val His Thr Lys Asn Asn Pro Arg Thr Ser Ser Arg Thr
145   150   155   160

His Ser Pro Pro Arg Ala Thr Thr Arg Thr Ala Arg Arg Thr Thr Thr
            165   170   175

Leu Arg Thr Ser Ser Thr Arg Lys Arg Pro Ser Thr Ala Ser Val Gln
            180   185   190

Pro Asp Ile Ser Ala Thr Thr His Lys Asn Glu Glu Ala Ser Pro Ala
        195   200   205

Ser Pro Gln Thr Ser Ala Ser Thr Thr Arg Ile Gln Arg Lys Ser Val
        210   215   220

Glu Ala Asn Thr Ser Thr Thr Tyr Asn Gln Thr Ser
225   230   235

<210>   12
<211>   2005
<212>   PRT
<213>   human metapneumovirus

<400>   12

Met Asp Pro Leu Asn Glu Ser Thr Val Asn Val Tyr Leu Pro Asp Ser
1   5   10   15

Tyr Leu Lys Gly Val Ile Ser Phe Ser Glu Thr Asn Ala Ile Gly Ser
        20   25   30

Cys Leu Leu Lys Arg Pro Tyr Leu Lys Asn Asp Asn Thr Ala Lys Val
        35   40   45

Ala Ile Glu Asn Pro Val Ile Glu His Val Arg Leu Lys Asn Ala Val
        50   55   60

Asn Ser Lys Met Lys Ile Ser Asp Tyr Lys Ile Val Glu Pro Val Asn
65   70   75   80

Met Gln His Glu Ile Met Lys Asn Val His Ser Cys Glu Leu Thr Leu
            85   90   95

Leu Lys Gln Phe Leu Thr Arg Ser Lys Asn Ile Ser Thr Leu Lys Leu
            100   105   110

Asn Met Ile Cys Asp Trp Leu Gln Leu Lys Ser Thr Ser Asp Asp Thr
        115   120   125

Ser Ile Leu Ser Phe Ile Asp Val Glu Phe Ile Pro Ser Trp Val Ser
        130   135   140

Asn Trp Phe Ser Asn Trp Tyr Asn Leu Asn Lys Leu Ile Leu Glu Phe
145   150   155   160

40

Arg Lys Glu Glu Val Ile Arg Thr Gly Ser Ile Leu Cys Arg Ser Leu
     165   170   175

Gly Lys Leu Val Phe Val Val Ser Ser Tyr Gly Cys Ile Val Lys Ser
     180   185   190

Asn Lys Ser Lys Arg Val Ser Phe Phe Thr Tyr Asn Gln Leu Leu Thr
     195   200   205

Trp Lys Asp Val Met Leu Ser Arg Phe Asn Ala Asn Phe Cys Ile Trp
     210   215   220

Val Ser Asn Ser Leu Asn Glu Asn Gln Glu Gly Leu Gly Leu Arg Ser
225   230   235   240

Asn Leu Gln Gly Ile Leu Thr Asn Lys Leu Tyr Glu Thr Val Asp Tyr
          245   250   255

Met Leu Ser Leu Cys Cys Asn Glu Gly Phe Ser Leu Val Lys Glu Phe
          260   265   270

Glu Gly Phe Ile Met Ser Glu Ile Leu Arg Ile Thr Glu His Ala Gln
        275   280   285

Phe Ser Thr Arg Phe Arg Asn Thr Leu Leu Asn Gly Leu Thr Asp Gln
     290   295   300

Leu Thr Lys Leu Lys Asn Lys Asn Arg Leu Arg Val His Gly Thr Val
305   310   315   320

Leu Glu Asn Asn Asp Tyr Pro Met Tyr Glu Val Val Leu Lys Leu Leu
          325   330   335

Gly Asp Thr Leu Arg Cys Ile Lys Leu Leu Ile Asn Lys Asn Leu Glu
          340   345   350

Asn Ala Ala Glu Leu Tyr Tyr Ile Phe Arg Ile Phe Gly His Pro Met
          355   360   365

Val Asp Glu Arg Asp Ala Met Asp Ala Val Lys Leu Asn Asn Glu Ile
        370   375   380

Thr Lys Ile Leu Arg Trp Glu Ser Leu Thr Glu Leu Arg Gly Ala Phe
        385   390   395   400

Ile Leu Arg Ile Ile Lys Gly Phe Val Asp Asn Asn Lys Arg Trp Pro
              405   410   415

Lys Ile Lys Asn Leu Lys Val Leu Ser Lys Arg Trp Thr Met Tyr Phe
              420   425   430

Lys Ala Lys Ser Tyr Pro Ser Gln Leu Glu Leu Ser Glu Gln Asp Phe
              435   440   445

Leu Glu Leu Ala Ala Ile Gln Phe Glu Gln Glu Phe Ser Val Pro Glu
    450   455   460

Lys Thr Asn Leu Glu Met Val Leu Asn Asp Lys Ala Ile Ser Pro Pro
465   470   475   480

Lys Arg Leu Ile Trp Ser Val Tyr Pro Lys Asn Tyr Leu Pro Glu Lys
              485   490   495

Ile Lys Asn Arg Tyr Leu Glu Glu Thr Phe Asn Ala Ser Asp Ser Leu
              500   505   510

Lys Thr Arg Arg Val Leu Glu Tyr Tyr Leu Lys Asp Asn Lys Phe Asp
              515   520   525

Gln Lys Glu Leu Lys Ser Tyr Val Val Lys Gln Glu Tyr Leu Asn Asp
    530   535   540

Lys Asp His Ile Val Ser Leu Thr Gly Lys Glu Arg Glu Leu Ser Val
545   550   555   560

Gly Arg Met Phe Ala Met Gln Pro Gly Lys Gln Arg Gln Ile Gln Ile
              565   570   575

Leu Ala Glu Lys Leu Leu Ala Asp Asn Ile Val Pro Phe Phe Pro Glu
              580   585   590

Thr Leu Thr Lys Tyr Gly Asp Leu Asp Leu Gln Arg Ile Met Glu Ile
    595   600   605

Lys Ser Glu Leu Ser Ser Ile Lys Thr Arg Arg Asn Asp Ser Tyr Asn
    610   615   620

Asn Tyr Ile Ala Arg Ala Ser Ile Val Thr Asp Leu Ser Lys Phe Asn
625   630   635   640

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Gln Ala Phe Arg Tyr Glu Thr Thr Ala Ile Cys Ala Asp Val Ala Asp
            645               650               655

Glu Leu His Gly Thr Gln Ser Leu Phe Cys Trp Leu His Leu Ile Val
            660               665               670

Pro Met Thr Thr Met Ile Cys Ala Tyr Arg His Ala Pro Pro Glu Thr
            675               680               685

Lys Gly Glu Tyr Asp Ile Asp Lys Ile Glu Glu Gln Ser Gly Leu Tyr
            690               695               700

Arg Tyr His Met Gly Gly Ile Glu Gly Trp Cys Gln Lys Leu Trp Thr
705               710               715                   720

Met Glu Ala Ile Ser Leu Leu Asp Val Val Ser Val Lys Thr Arg Cys
                725               730               735

Gln Met Thr Ser Leu Leu Asn Gly Asp Asn Gln Ser Ile Asp Val Ser
            740               745               750

Lys Pro Val Lys Leu Ser Glu Gly Leu Asp Glu Val Lys Ala Asp Tyr
            755               760               765

Ser Leu Ala Val Lys Met Leu Lys Glu Ile Arg Asp Ala Tyr Arg Asn
    770               775               780

Ile Gly His Lys Leu Lys Glu Gly Glu Thr Tyr Ile Ser Arg Asp Leu
785               790               795                   800

Gln Phe Ile Ser Lys Val Ile Gln Ser Glu Gly Val Met His Pro Thr
                805               810               815

Pro Ile Lys Lys Ile Leu Arg Val Gly Pro Trp Ile Asn Thr Ile Leu
            820               825               830

Asp Asp Ile Lys Thr Ser Ala Glu Ser Ile Gly Ser Leu Cys Gln Glu
            835               840               845

Leu Glu Phe Arg Gly Glu Ser Ile Ile Val Ser Leu Ile Leu Arg Asn
    850               855               860

Phe Trp Leu Tyr Asn Leu Tyr Met His Glu Ser Lys Gln His Pro Leu
865               870               875                   880
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Ala Gly Lys Gln Leu Phe Lys Gln Leu Asn Lys Thr Leu Thr Ser Val
              885                   890                   895

Gln Arg Phe Phe Glu Ile Lys Lys Glu Asn Glu Val Val Asp Leu Trp
              900                   905                   910

Met Asn Ile Pro Met Gln Phe Gly Gly Gly Asp Pro Val Val Phe Tyr
          915                   920                   925

Arg Ser Phe Tyr Arg Arg Thr Pro Asp Phe Leu Thr Glu Ala Ile Ser
    930                   935                   940

His Val Asp Ile Leu Leu Arg Ile Ser Ala Asn Ile Arg Asn Glu Ala
945                   950                   955                   960

Lys Ile Ser Phe Phe Lys Ala Leu Leu Ser Ile Glu Lys Asn Glu Arg
              965                   970                   975

Ala Thr Leu Thr Thr Leu Met Arg Asp Pro Gln Ala Val Gly Ser Glu
          980                   985                   990

Arg Gln Ala Lys Val Thr Ser Asp   Ile Asn Arg Thr Ala  Val Thr Ser
    995                   1000                   1005

Ile Leu  Ser Leu Ser Pro Asn  Gln Leu Phe Ser Asp  Ser Ala Ile
    1010                   1015                   1020

His Tyr  Ser Arg Asn Glu Glu  Glu Val Gly Ile Ile  Ala Asp Asn
    1025                   1030                   1035

Ile Thr  Pro Val Tyr Pro His  Gly Leu Arg Val Leu  Tyr Glu Ser
    1040                   1045                   1050

Leu Pro  Phe His Lys Ala Glu  Lys Val Val Asn Met  Ile Ser Gly
    1055                   1060                   1065

Thr Lys  Ser Ile Thr Asn Leu  Leu Gln Arg Thr Ser  Ala Ile Asn
    1070                   1075                   1080

Gly Glu  Asp Ile Asp Arg Ala  Val Ser Met Met Leu  Glu Asn Leu
    1085                   1090                   1095

Gly Leu  Leu Ser Arg Ile Leu  Ser Val Val Val Asp  Ser Ile Glu
    1100                   1105                   1110
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Ile Pro Thr Lys Ser Asn Gly Arg Leu Ile Cys Cys Gln Ile Ser
    1115   1120   1125

Arg Thr Leu Arg Glu Thr Ser Trp Asn Asn Met Glu Ile Val Gly
    1130   1135   1140

Val Thr Ser Pro Ser Ile Thr Thr Cys Met Asp Val Ile Tyr Ala
    1145   1150   1155

Thr Ser Ser His Leu Lys Gly Ile Ile Ile Glu Lys Phe Ser Thr
    1160   1165   1170

Asp Arg Thr Thr Arg Gly Gln Arg Gly Pro Lys Ser Pro Trp Val
    1175   1180   1185

Gly Ser Ser Thr Gln Glu Lys Lys Leu Val Pro Val Tyr Asn Arg
    1190   1195   1200

Gln Ile Leu Ser Lys Gln Gln Arg Glu Gln Leu Glu Ala Ile Gly
    1205   1210   1215 .

Lys Met Arg Trp Val Tyr Lys Gly Thr Pro Gly Leu Arg Arg Leu
    1220   1225   1230

Leu Asn Lys Ile Cys Leu Gly Ser Leu Gly Ile Ser Tyr Lys Cys
    1235   1240   1245

Val Lys Pro Leu Leu Pro Arg Phe Met Ser Val Asn Phe Leu His
    1250   1255   1260

Arg Leu Ser Val Ser Ser Arg Pro Met Glu Phe Pro Ala Ser Val
    1265   1270   1275

Pro Ala Tyr Arg Thr Thr Asn Tyr His Phe Asp Thr Ser Pro Ile
    1280   1285   1290

Asn Gln Ala Leu Ser Glu Arg Phe Gly Asn Glu Asp Ile Asn Leu
    1295   1300   1305

Val Phe Gln Asn Ala Ile Ser Cys Gly Ile Ser Ile Met Ser Val
    1310   1315   1320

Val Glu Gln Leu Thr Gly Arg Ser Pro Lys Gln Leu Val Leu Ile
    1325   1330   1335

45

Pro Gln Leu Glu Glu Ile Asp Ile Met Pro Pro Pro Val Phe Gln
    1340   1345   1350

Gly Lys Phe Asn Tyr Lys Leu Val Asp Lys Ile Thr Ser Asp Gln
    1355   1360   1365

His Ile Phe Ser Pro Asp Lys Ile Asp Met Leu Thr Leu Gly Lys
    1370   1375   1380

Met Leu Met Pro Thr Ile Lys Gly Gln Lys Thr Asp Gln Phe Leu
    1385   1390   1395

Asn Lys Arg Glu Asn Tyr Phe His Gly Asn Asn Leu Ile Glu Ser
    1400   1405   1410

Leu Ser Ala Ala Leu Ala Cys His Trp Cys Gly Ile Leu Thr Glu
    1415   1420   1425

Gln Cys Ile Glu Asn Asn Ile Phe Lys Lys Asp Trp Gly Asp Gly
    1430   1435   1440

Phe Ile Ser Asp His Ala Phe Met Asp Phe Lys Ile Phe Leu Cys
    1445   1450   1455

Val Phe Lys Thr Lys Leu Leu Cys Ser Trp Gly Ser Gln Gly Lys
    1460   1465   1470

Asn Ile Lys Asp Glu Asp Ile Val Asp Glu Ser Ile Asp Lys Leu
    1475   1480   1485

Leu Arg Ile Asp Asn Thr Phe Trp Arg Met Phe Ser Lys Val Met
    1490   1495   1500

Phe Glu Ser Lys Val Lys Lys Arg Ile Met Leu Tyr Asp Val Lys
    1505   1510   1515

Phe Leu Ser Leu Val Gly Tyr Ile Gly Phe Lys Asn Trp Phe Ile
    1520   1525   1530

Glu Gln Leu Arg Ser Ala Glu Leu His Glu Val Pro Trp Ile Val
    1535   1540   1545

Asn Ala Glu Gly Asp Leu Val Glu Ile Lys Ser Ile Lys Ile Tyr
    1550   1555   1560

46

Leu Gln Leu Ile Glu Gln Ser Leu Phe Leu Arg Ile Thr Val Leu
     1565   1570   1575

Asn Tyr Thr Asp Met Ala His Ala Leu Thr Arg Leu Ile Arg Lys
     1580   1585   1590

Lys Leu Met Cys Asp Asn Ala Leu Leu Thr Pro Ile Pro Ser Pro
     1595   1600   1605

Met Val Asn Leu Thr Gln Val Ile Asp Pro Thr Glu Gln Leu Ala
     1610   1615   1620

Tyr Phe Pro Lys Ile Thr Phe Glu Arg Leu Lys Asn Tyr Asp Thr
     1625   1630   1635

Ser Ser Asn Tyr Ala Lys Gly Lys Leu Thr Arg Asn Tyr Met Ile
     1640.   1645   1650

Leu Leu Pro Trp Gln His Val Asn Arg Tyr Asn Phe Val Phe Ser
     1655   1660   1665

Ser Thr Gly Cys Lys Val Ser Leu Lys Thr Cys Ile Gly Lys Leu
     1670   1675   1680

Met Lys Asp Leu Asn Pro Lys Val Leu Tyr Phe Ile Gly Glu Gly
     1685   1690   1695

Ala Gly Asn Trp Met Ala Arg Thr Ala Cys Glu Tyr Pro Asp Ile
     1700   1705   1710

Lys Phe Val Tyr Arg Ser Leu Lys Asp Asp Leu Asp His His Tyr
     1715   1720   1725

Pro Leu Glu Tyr Gln Arg Val Ile Gly Glu Leu Ser Arg Ile Ile
     1730   1735   1740

Asp Ser Gly Glu Gly Leu Ser Met Glu Thr Thr Asp Ala Thr Gln
     1745   1750   1755

Lys Thr His Trp Asp Leu Ile His Arg Val Ser Lys Asp Ala Leu
     1760   1765   1770

Leu Ile Thr Leu Cys Asp Ala Glu Phe Lys Asp Arg Asp Asp Phe
     1775   1780   1785

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Phe Lys  Met Val Ile Leu Trp  Arg Lys His Val Leu  Ser Cys Arg
    1790              1795              1800

Ile Cys  Thr Thr Tyr Gly Thr  Asp Leu Tyr Leu Phe  Ala Lys Tyr
    1805              1810              1815

His Ala  Lys Asp Cys Asn Val  Lys Leu Pro Phe Phe  Val Arg Ser
    1820              1825              1830

Val Ala  Thr Phe Ile Met Gln  Gly Ser Lys Leu Ser  Gly Ser Glu
    1835              1840              1845

Cys Tyr  Ile Leu Leu Thr Leu  Gly His His Asn Asn  Leu Pro Cys
    1850              1855              1860

His Gly  Glu Ile Gln Asn Ser  Lys Met Lys Ile Ala  Val Cys Asn
    1865              1870              1875

Asp Phe  Tyr Ala Ala Lys Lys  Leu Asp Asn Lys Ser  Ile Glu Ala
    1880              1885              1890

Asn Cys  Lys Ser Leu Leu Ser  Gly Leu Arg Ile Pro  Ile Asn Lys
    1895              1900              1905

Lys Glu  Leu Asn Arg Gln Arg  Arg Leu Leu Thr Leu  Gln Ser Asn
    1910              1915              1920

His Ser  Ser Val Ala Thr Val  Gly Gly Ser Lys Val  Ile Glu Ser
    1925              1930              1935

Lys Trp  Leu Thr Asn Lys Ala  Asn Thr Ile Ile Asp  Trp Leu Glu
    1940              1945              1950

His Ile  Leu Asn Ser Pro Lys  Gly Glu Leu Asn Tyr  Asp Phe Phe
    1955              1960              1965

Glu Ala  Leu Glu Asn Thr Tyr  Pro Asn Met Ile Lys  Leu Ile Asp
    1970              1975              1980

Asn Leu  Gly Asn Ala Glu Ile  Lys Lys Leu Ile Lys  Val Thr Gly
    1985              1990              1995

Tyr Met  Leu Val Ser Lys Lys
    2000              2005
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<210> 13
<211> 2165
<212> PRT
<213> human respiratory syncytial virus strain A2

<400> 13

Met Asp Pro Ile Ile Asn Gly Asn Ser Ala Asn Val Tyr Leu Thr Asp
1   5   10   15

Ser Tyr Leu Lys Gly Val Ile Ser Phe Ser Glu Cys Asn Ala Leu Gly
            20   25   30

Ser Tyr Ile Phe Asn Gly Pro Tyr Leu Lys Asn Asp Tyr Thr Asn Leu
            35   40   45

Ile Ser Arg Gln Asn Pro Leu Ile Glu His Met Asn Leu Lys Lys Leu
        50   55   60

Asn Ile Thr Gln Ser Leu Ile Ser Lys Tyr His Lys Gly Glu Ile Lys
65   70   75   80

Leu Glu Glu Pro Thr Tyr Phe Gln Ser Leu Leu Met Thr Tyr Lys Ser
                85   90   95

Met Thr Ser Ser Glu Gln Ile Ala Thr Thr Asn Leu Leu Lys Lys Ile
            100   105   110

Ile Arg Arg Ala Ile Glu Ile Ser Asp Val Lys Val Tyr Ala Ile Leu
        115   120   125

Asn Lys Leu Gly Leu Lys Glu Lys Asp Lys Ile Lys Ser Asn Asn Gly
        130   135   140

Gln Asp Glu Asp Asn Ser Val Ile Thr Thr Ile Ile Lys Asp Asp Ile
145   150   155   160

Leu Ser Ala Val Lys Asp Asn Gln Ser His Leu Lys Ala Asp Lys Asn
                165   170   175

His Ser Thr Lys Gln Lys Asp Thr Ile Lys Thr Thr Leu Leu Lys Lys
                180   185   190

Leu Met Cys Ser Met Gln His Pro Pro Ser Trp Leu Ile His Trp Phe
            195   200   205

Asn Leu Tyr Thr Lys Leu Asn Asn Ile Leu Thr Gln Tyr Arg Ser Asn

49

Glu Val Lys Asn His Gly Phe Thr Leu Ile Asp Asn Gln Thr Leu Ser
225   230   235   240

Gly Phe Gln Phe Ile Leu Asn Gln Tyr Gly Cys Ile Val Tyr His Lys
                245   250   255

Glu Leu Lys Arg Ile Thr Val Thr Thr Tyr Asn Gln Phe Leu Thr Trp
            260   265   270

Lys Asp Ile Ser Leu Ser Arg Leu Asn Val Cys Leu Ile Thr Trp Ile
        275   280   285

Ser Asn Cys Leu Asn Thr Leu Asn Lys Ser Leu Gly Leu Arg Cys Gly
    290   295   300

Phe Asn Asn Val Ile Leu Thr Gln Leu Phe Leu Tyr Gly Asp Cys Ile
305   310   315   320

Leu Lys Leu Phe His Asn Glu Gly Phe Tyr Ile Ile Lys Glu Val Glu
            325   330   335

Gly Phe Ile Met Ser Leu Ile Leu Asn Ile Thr Glu Glu Asp Gln Phe
        340   345   350

Arg Lys Arg Phe Tyr Asn Ser Met Leu Asn Asn Ile Thr Asp Ala Ala
        355   360   365

Asn Lys Ala Gln Lys Asn Leu Leu Ser Arg Val Cys His Thr Leu Leu
    370   375   380

Asp Lys Thr Val Ser Asp Asn Ile Ile Asn Gly Arg Trp Ile Ile Leu
385   390   395   400

Leu Ser Lys Phe Leu Lys Leu Ile Lys Leu Ala Gly Asp Asn Asn Leu
            405   410   415

Asn Asn Leu Ser Glu Leu Tyr Phe Leu Phe Arg Ile Phe Gly His Pro
            420   425   430

Met Val Asp Glu Arg Gln Ala Met Asp Ala Val Lys Ile Asn Cys Asn
        435   440   445

Glu Thr Lys Phe Tyr Leu Leu Ser Ser Leu Ser Met Leu Arg Gly Ala

Phe Ile Tyr Arg Ile Ile Lys Gly Phe Val Asn Asn Tyr Asn Arg Trp
465   470   475   480

Pro Thr Leu Arg Asn Ala Ile Val Leu Pro Leu Arg Trp Leu Thr Tyr
          485   490   495

Tyr Lys Leu Asn Thr Tyr Pro Ser Leu Leu Glu Leu Thr Glu Arg Asp
          500   505   510

Leu Ile Val Leu Ser Gly Leu Arg Phe Tyr Arg Glu Phe Arg Leu Pro
          515   520   525

Lys Lys Val Asp Leu Glu Met Ile Ile Asn Asp Lys Ala Ile Ser Pro
          530   535   540

Pro Lys Asn Leu Ile Trp Thr Ser Phe Pro Arg Asn Tyr Met Pro Ser
545   550   555   560

His Ile Gln Asn Tyr Ile Glu His Glu Lys Leu Lys Phe Ser Glu Ser
          565   570   575

Asp Lys Ser Arg Arg Val Leu Glu Tyr Tyr Leu Arg Asp Asn Lys Phe
          580   585   590

Asn Glu Cys Asp Leu Tyr Asn Cys Val Val Asn Gln Ser Tyr Leu Asn
          595   600   605

Asn Pro Asn His Val Val Ser Leu Thr Gly Lys Glu Arg Glu Leu Ser
    610   615   620

Val Gly Arg Met Phe Ala Met Gln Pro Gly Met Phe Arg Gln Val Gln
625   630   635   640

Ile Leu Ala Glu Lys Met Ile Ala Glu Asn Ile Leu Gln Phe Phe Pro
          645   650   655

Glu Ser Leu Thr Arg Tyr Gly Asp Leu Glu Leu Gln Lys Ile Leu Glu
          660   665   670

Leu Lys Ala Gly Ile Ser Asn Lys Ser Asn Arg Tyr Asn Asp Asn Tyr
          675   680   685

Asn Asn Tyr Ile Ser Lys Cys Ser Ile Ile Thr Asp Leu Ser Lys Phe
                              51

Asn Gln Ala Phe Arg Tyr Glu Thr Ser Cys Ile Cys Ser Asp Val Leu
705 710 715 720

Asp Glu Leu His Gly Val Gln Ser Leu Phe Ser Trp Leu His Leu Thr
725 730 735

Ile Pro His Val Thr Ile Ile Cys Thr Tyr Arg His Ala Pro Pro Tyr
740 745 750

Ile Gly Asp His Ile Val Asp Leu Asn Asn Val Asp Glu Gln Ser Gly
755 760 765

Leu Tyr Arg Tyr His Met Gly Gly Ile Glu Gly Trp Cys Gln Lys Leu
770 775 780

Trp Thr Ile Glu Ala Ile Ser Leu Leu Asp Leu Ile Ser Leu Lys Gly
785 790 795 800

Lys Phe Ser Ile Thr Ala Leu Ile Asn Gly Asp Asn Gln Ser Ile Asp
805 810 815

Ile Ser Lys Pro Ile Arg Leu Met Glu Gly Gln Thr His Ala Gln Ala
820 825 830

Asp Tyr Leu Leu Ala Leu Asn Ser Leu Lys Leu Leu Tyr Lys Glu Tyr
835 840 845

Ala Gly Ile Gly His Lys Leu Lys Gly Thr Glu Thr Tyr Ile Ser Arg
850 855 860

Asp Met Gln Phe Met Ser Lys Thr Ile Gln His Asn Gly Val Tyr Tyr
865 870 875 880

Pro Ala Ser Ile Lys Lys Val Leu Arg Val Gly Pro Trp Ile Asn Thr
885 890 895

Ile Leu Asp Asp Phe Lys Val Ser Leu Glu Ser Ile Gly Ser Leu Thr
900 905 910

Gln Glu Leu Glu Tyr Arg Gly Glu Ser Leu Leu Cys Ser Leu Ile Phe
915 920 925

Arg Asn Val Trp Leu Tyr Asn Gln Ile Ala Leu Gln Leu Lys Asn His

52

Ala Leu Cys Asn Asn Lys Leu Tyr Leu Asp Ile Leu Lys Val Leu Lys
945　950　955　960

His Leu Lys Thr Phe Phe Asn Leu Asp Asn Ile Asp Thr Ala Leu Thr
965　970　975

Leu Tyr Met Asn Leu Pro Met Leu Phe Gly Gly Gly Asp Pro Asn Leu
980　985　990

Leu Tyr Arg Ser Phe Tyr Arg Arg Thr Pro Asp Phe Leu Thr Glu Ala
995　1000　1005

Ile Val His Ser Val Phe Ile Leu Ser Tyr Tyr Thr Asn His Asp
1010　1015　1020

Leu Lys Asp Lys Leu Gln Asp Leu Ser Asp Asp Arg Leu Asn Lys
1025　1030　1035

Phe Leu Thr Cys Ile Ile Thr Phe Asp Lys Asn Pro Asn Ala Glu
1040　1045　1050

Phe Val Thr Leu Met Arg Asp Pro Gln Ala Leu Gly Ser Glu Arg
1055　1060　1065

Gln Ala Lys Ile Thr Ser Glu Ile Asn Arg Leu Ala Val Thr Glu
1070　1075　1080

Val Leu Ser Thr Ala Pro Asn Lys Ile Phe Ser Lys Ser Ala Gln
1085　1090　1095

His Tyr Thr Thr Thr Glu Ile Asp Leu Asn Asp Ile Met Gln Asn
1100　1105　1110

Ile Glu Pro Thr Tyr Pro His Gly Leu Arg Val Val Tyr Glu Ser
1115　1120　1125

Leu Pro Phe Tyr Lys Ala Glu Lys Ile Val Asn Leu Ile Ser Gly
1130　1135　1140

Thr Lys Ser Ile Thr Asn Ile Leu Glu Lys Thr Ser Ala Ile Asp
1145　1150　1155

Leu Thr Asp Ile Asp Arg Ala Thr Glu Met Met Arg Lys Asn Ile

53

Thr Leu Leu Ile Arg Ile Leu Pro Leu Asp Cys Asn Arg Asp Lys
    1175   1180   1185

Arg Glu Ile Leu Ser Met Glu Asn Leu Ser Ile Thr Glu Leu Ser
    1190   1195   1200

Lys Tyr Val Arg Glu Arg Ser Trp Ser Leu Ser Asn Ile Val Gly
    1205   1210   1215

Val Thr Ser Pro Ser Ile Met Tyr Thr Met Asp Ile Lys Tyr Thr
    1220   1225   1230

Thr Ser Thr Ile Ser Ser Gly Ile Ile Ile Glu Lys Tyr Asn Val
    1235   1240   1245

Asn Ser Leu Thr Arg Gly Glu Arg Gly Pro Thr Lys Pro Trp Val
    1250   1255   1260

Gly Ser Ser Thr Gln Glu Lys Lys Thr Met Pro Val Tyr Asn Arg
    1265   1270   1275

Gln Val Leu Thr Lys Lys Gln Arg Asp Gln Ile Asp Leu Leu Ala
    1280   1285   1290

Lys Leu Asp Trp Val Tyr Ala Ser Ile Asp Asn Lys Asp Glu Phe
    1295   1300   1305

Met Glu Glu Leu Ser Ile Gly Thr Leu Gly Leu Thr Tyr Glu Lys
    1310   1315   1320

Ala Lys Lys Leu Phe Pro Gln Tyr Leu Ser Val Asn Tyr Leu His
    1325   1330   1335

Arg Leu Thr Val Ser Ser Arg Pro Cys Glu Phe Pro Ala Ser Ile
    1340   1345   1350

Pro Ala Tyr Arg Thr Thr Asn Tyr His Phe Asp Thr Ser Pro Ile
    1355   1360   1365

Asn Arg Ile Leu Thr Glu Lys Tyr Gly Asp Glu Asp Ile Asp Ile
    1370   1375   1380

Val Phe Gln Asn Cys Ile Ser Phe Gly Leu Ser Leu Met Ser Val

Val Glu Gln Phe Thr Asn Val Cys Pro Asn Arg Ile Ile Leu Ile
                1400   1405   1410

Pro Lys Leu Asn Glu Ile His Leu Met Lys Pro Pro Ile Phe Thr
                1415   1420   1425

Gly Asp Val Asp Ile His Lys Leu Lys Gln Val Ile Gln Lys Gln
                1430   1435   1440

His Met Phe Leu Pro Asp Lys Ile Ser Leu Thr Gln Tyr Val Glu
                1445   1450   1455

Leu Phe Leu Ser Asn Lys Thr Leu Lys Ser Gly Ser His Val Asn
                1460   1465   1470

Ser Asn Leu Ile Leu Ala His Lys Ile Ser Asp Tyr Phe His Asn
                1475   1480   1485

Thr Tyr Ile Leu Ser Thr Asn Leu Ala Gly His Trp Ile Leu Ile
                1490   1495   1500

Ile Gln Leu Met Lys Asp Ser Lys Gly Ile Phe Glu Lys Asp Trp
                1505   1510   1515

Gly Glu Gly Tyr Ile Thr Asp His Met Phe Ile Asn Leu Lys Val
                1520   1525   1530

Phe Phe Asn Ala Tyr Lys Thr Tyr Leu Leu Cys Phe His Lys Gly
                1535   1540   1545

Tyr Gly Lys Ala Lys Leu Glu Cys Asp Met Asn Thr Ser Asp Leu
                1550   1555   1560

Leu Cys Val Leu Glu Leu Ile Asp Ser Ser Tyr Trp Lys Ser Met
                1565   1570   1575

Ser Lys Val Phe Leu Glu Gln Lys Val Ile Lys Tyr Ile Leu Ser
                1580   1585   1590

Gln Asp Ala Ser Leu His Arg Val Lys Gly Cys His Ser Phe Lys
                1595   1600   1605

Leu Trp Phe Leu Lys Arg Leu Asn Val Ala Glu Phe Thr Val Cys

55

1610   1615   1620

Pro Trp Val Val Asn Ile Asp Tyr His Pro Thr His Met Lys Ala
1625   1630   1635

Ile Leu Thr Tyr Ile Asp Leu Val Arg Met Gly Leu Ile Asn Ile
1640   1645   1650

Asp Arg Ile His Ile Lys Asn Lys His Lys Phe Asn Asp Glu Phe
1655   1660   1665

Tyr Thr Ser Asn Leu Phe Tyr Ile Asn Tyr Asn Phe Ser Asp Asn
1670   1675   1680

Thr His Leu Leu Thr Lys His Ile Arg Ile Ala Asn Ser Glu Leu
1685   1690   1695

Glu Asn Asn Tyr Asn Lys Leu Tyr His Pro Thr Pro Glu Thr Leu
1700   1705   1710

Glu Asn Ile Leu Ala Asn Pro Ile Lys Ser Asn Asp Lys Lys Thr
1715   1720   1725

Leu Asn Asp Tyr Cys Ile Gly Lys Asn Val Asp Ser Ile Met Leu
1730   1735   1740

Pro Leu Leu Ser Asn Lys Lys Leu Ile Lys Ser Ser Ala Met Ile
1745   1750   1755

Arg Thr Asn Tyr Ser Lys Gln Asp Leu Tyr Asn Leu Phe Pro Met
1760   1765   1770

Val Val Ile Asp Arg Ile Ile Asp His Ser Gly Asn Thr Ala Lys
1775   1780   1785

Ser Asn Gln Leu Tyr Thr Thr Thr Ser His Gln Ile Ser Leu Val
1790   1795   1800

His Asn Ser Thr Ser Leu Tyr Cys Met Leu Pro Trp His His Ile
1805   1810   1815

Asn Arg Phe Asn Phe Val Phe Ser Ser Thr Gly Cys Lys Ile Ser
1820   1825   1830

Ile Glu Tyr Ile Leu Lys Asp Leu Lys Ile Lys Asp Pro Asn Cys

56

Ile Ala Phe Ile Gly Glu Gly Ala Gly Asn Leu Leu Leu Arg Thr
1850   1855   1860

Val Val Glu Leu His Pro Asp Ile Arg Tyr Ile Tyr Arg Ser Leu
1865   1870   1875

Lys Asp Cys Asn Asp His Ser Leu Pro Ile Glu Phe Leu Arg Leu
1880   1885   1890

Tyr Asn Gly His Ile Asn Ile Asp Tyr Gly Glu Asn Leu Thr Ile
1895   1900   1905

Pro Ala Thr Asp Ala Thr Asn Asn Ile His Trp Ser Tyr Leu His
1910   1915   1920

Ile Lys Phe Ala Glu Pro Ile Ser Leu Phe Val Cys Asp Ala Glu
1925   1930   1935

Leu Ser Val Thr Val Asn Trp Ser Lys Ile Ile Ile Glu Trp Ser
1940   1945   1950

Lys His Val Arg Lys Cys Lys Tyr Cys Ser Ser Val Asn Lys Cys
1955   1960   1965

Met Leu Ile Val Lys Tyr His Ala Gln Asp Asp Ile Asp Phe Lys
1970   1975   1980

Leu Asp Asn Ile Thr Ile Leu Lys Thr Tyr Val Cys Leu Gly Ser
1985   1990   1995

Lys Leu Lys Gly Ser Glu Val Tyr Leu Val Leu Thr Ile Gly Pro
2000   2005   2010

Ala Asn Ile Phe Pro Val Phe Asn Val Val Gln Asn Ala Lys Leu
2015   2020   2025

Ile Leu Ser Arg Thr Lys Asn Phe Ile Met Pro Lys Lys Ala Asp
2030   2035   2040

Lys Glu Ser Ile Asp Ala Asn Ile Lys Ser Leu Ile Pro Phe Leu
2045   2050   2055

Cys Tyr Pro Ile Thr Lys Lys Gly Ile Asn Thr Ala Leu Ser Lys

57

2060   2065   2070

Leu Lys Ser Val Val Ser Gly Asp Ile Leu Ser Tyr Ser Ile Ala
     2075   2080   2085

Gly Arg Asn Glu Val Phe Ser Asn Lys Leu Ile Asn His Lys His
     2090   2095   2100

Met Asn Ile Leu Lys Trp Phe Asn His Val Leu Asn Phe Arg Ser
     2105   2110   2115

Thr Glu Leu Asn Tyr Asn His Leu Tyr Met Val Glu Ser Thr Tyr
     2120   2125   2130

Pro Tyr Leu Ser Glu Leu Leu Asn Ser Leu Thr Thr Asn Glu Leu
     2135   2140   2145

Lys Lys Leu Ile Lys Ile Thr Gly Ser Leu Leu Tyr Asn Phe His
     2150   2155   2160

Asn Glu
     2165

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Met Asp Thr Glu Ser Asn Asn Gly Thr Val Ser Asp Ile Leu Tyr Pro
1   5   10   15

Glu Cys His Leu Asn Ser Pro Ile Val Lys Gly Lys Ile Ala Gln Leu
              20   25   30

His Thr Ile Met Ser Leu Pro Gln Pro Tyr Asp Met Asp Asp Asp Ser
              35   40   45

Ile Leu Val Ile Thr Arg Gln Lys Ile Lys Leu Asn Lys Leu Asp Lys
              50   55   60

Arg Gln Arg Ser Ile Arg Arg Leu Lys Leu Ile Leu Thr Glu Lys Val
65   70   75   80

Asn Asp Leu Gly Lys Tyr Thr Phe Ile Arg Tyr Pro Glu Met Ser Lys
              85   90   95

58

Glu Met Phe Lys Leu His Ile Pro Gly Ile Asn Ser Lys Val Thr Glu
         100   105   110

Leu Leu Leu Lys Ala Asp Arg Thr Tyr Ser Gln Met Thr Asp Gly Leu
         115   120   125

Arg Asp Leu Trp Ile Asn Val Leu Ser Lys Leu Ala Ser Lys Asn Asp
   130   135   140

Gly Ser Asn Tyr Asp Leu Asn Glu Glu Ile Asn Asn Ile Ser Lys Val
145   150   155   160

His Thr Thr Tyr Lys Ser Asp Lys Trp Tyr Asn Pro Phe Lys Thr Trp
         165   170   175

Phe Thr Ile Lys Tyr Asp Met Arg Arg Leu Gln Lys Ala Arg Asn Glu
         180   185   190

Val Thr Phe Asn Met Gly Lys Asp Tyr Asn Leu Leu Glu Asp Gln Lys
         195   200   205

Asn Phe Leu Leu Ile His Pro Glu Leu Val Leu Ile Leu Asp Lys Gln
225   215   220

Asn Tyr Asn Gly Tyr Leu Ile Thr Pro Glu Leu Val Leu Pro Tyr Cys
225   230   235   240

Asp Val Val Glu Gly Arg Trp Asn Ile Ser Ala Cys Ala Lys Leu Asp
         245   250   255

Pro Lys Leu Gln Ser Met Tyr Gln Lys Gly Asn Asn Leu Trp Glu Val
         260   265   270

Ile Asp Lys Leu Phe Pro Ile Met Gly Glu Lys Thr Phe Asp Val Ile
         275   280   285

Ser Leu Leu Glu Pro Leu Ala Leu Ser Leu Ile Gln Thr His Asp Pro
         290   295   300

Val Lys Gln Leu Arg Gly Ala Phe Leu Asn His Val Leu Ser Glu Met
305   310   315   320

Glu Leu Ile Phe Glu Ser Arg Glu Ser Ile Lys Glu Phe Leu Ser Val
         325   330   335

Asp Tyr Ile Asp Lys Ile Leu Asp Ile Phe Asn Lys Ser Thr Ile Asp
                340   345   350

Glu Ile Ala Glu Ile Phe Ser Phe Phe Arg Thr Phe Gly His Pro Pro
            355   360   365

Leu Glu Ala Ser Ile Ala Ala Glu Lys Val Arg Lys Tyr Met Tyr Ile
    370   375   380

Gly Lys Gln Leu Lys Phe Asp Thr Ile Asn Lys Cys His Ala Ile Phe
385   390   395   400

Cys Thr Ile Ile Ile Asn Gly Tyr Arg Glu Arg His Gly Gly Gln Trp
            405   410   415

Pro Pro Val Thr Leu Pro Asp His Ala His Glu Phe Ile Ile Asn Ala
            420   425   430

Tyr Gly Ser Asn Ser Ala Ile Ser Tyr Glu Asn Ala Val Asp Tyr Tyr
        435   440   445

Gln Ser Phe Ile Gly Ile Lys Phe Asn Lys Phe Ile Glu Pro Gln Leu
    450   455   460

Asp Glu Asp Leu Thr Ile Tyr Met Lys Asp Lys Ala Leu Ser Pro Lys
465   470   475   480

Lys Ser Asn Trp Asp Thr Val Ser Pro Ala Ser Asn Leu Leu Tyr Arg
            485   490   495

Thr Asn Ala Ser Asn Glu Ser Arg Arg Leu Val Glu Lys Phe Ile Ala
            500   505   510

Asp Ser Lys Phe Asp Pro Asn Gln Ile Leu Asp Tyr Val Glu Ser Gly
        515   520   525

Asp Trp Leu Asp Asp Pro Glu Phe Asn Ile Ser Tyr Ser Leu Lys Glu
    530   535   540

Lys Glu Ile Lys Gln Glu Gly Arg Leu Phe Ala Lys Met Thr Tyr Lys
545   550   555   560

Met Arg Ala Thr Gln Val Leu Ser Glu Thr Leu Leu Ala Asn Asn Ile
            565   570   575

60

Gly Lys Phe Phe Gln Glu Asn Gly Met Val Lys Gly Glu Ile Glu Leu
        580   585   590

Leu Lys Arg Leu Thr Thr Ile Ser Ile Ser Gly Val Pro Arg Tyr Asn
        595   600   605

Glu Val Tyr Asn Asn Ser Lys Ser His Thr Asp Asp Leu Lys Thr Tyr
610   615   620

Asn Lys Ile Ser Asn Leu Asn Leu Ser Ser Asn Gln Lys Ser Lys Lys
625   630   635   640

Phe Glu Phe Lys Ser Thr Asp Ile Tyr Asn Asp Gly Tyr Glu Thr Val
        645   650   655

Ser Cys Phe Leu Thr Thr Asp Leu Lys Lys Tyr Cys Leu Asn Trp Arg
        660   665   670

Tyr Glu Ser Thr Ala Leu Phe Gly Glu Thr Cys Asn Gln Ile Phe Gly
        675   680   685

Leu Asn Lys Leu Phe Asn Trp Leu His Pro Arg Leu Glu Gly Ser Thr
690   695   700

Ile Tyr Val Gly Asp Pro Tyr Cys Pro Pro Ser Asp Lys Glu His Ile
705   710   715   720

Ser Leu Glu Asp His Pro Asp Ser Gly Phe Tyr Val His Asn Pro Arg
            725   730   735

Gly Gly Ile Glu Gly Phe Cys Gln Lys Leu Trp Thr Leu Ile Ser Ile
        740   745   750

Ser Ala Ile His Leu Ala Ala Val Arg Ile Gly Val Arg Val Thr Ala
        755   760   765

Met Val Gln Gly Asp Asn Gln Ala Ile Ala Val Thr Thr Arg Val Pro
        770   775   780

Asn Asn Tyr Asp Tyr Arg Val Lys Lys Glu Ile Val Tyr Lys Asp Val
785   790   795   800

Val Arg Phe Phe Asp Ser Leu Arg Glu Val Met Asp Asp Leu Gly His
            805   810   815

61

Glu Leu Lys Leu Asn Glu Thr Ile Ile Ser Ser Lys Met Phe Ile Tyr
                820   825   830

Ser Lys Arg Ile Tyr Tyr Asp Gly Arg Ile Leu Pro Gln Ala Leu Lys
            835   840   845

Ala Leu Ser Arg Cys Val Phe Trp Ser Glu Thr Val Ile Asp Glu Thr
        850   855   860

Arg Ser Ala Ser Ser Asn Leu Ala Thr Ser Phe Ala Lys Ala Ile Glu
865   870   875   880

Asn Gly Tyr Ser Pro Val Leu Gly Tyr Ala Cys Ser Ile Phe Lys Asn
                885   890   895

Ile Gln Gln Leu Tyr Ile Ala Leu Gly Met Asn Ile Asn Pro Thr Ile
            900   905   910

Thr Gln Asn Ile Lys Asp Leu Tyr Phe Arg Asn Pro Asn Trp Met Gln
            915   920   925

Tyr Ala Ser Leu Ile Pro Ala Ser Val Gly Gly Phe Asn Tyr Met Ala
    930   935   940

Met Ser Arg Cys Phe Val Arg Asn Ile Gly Asp Pro Ser Val Ala Ala
945   950   955   960

Leu Ala Asp Ile Lys Arg Phe Ile Lys Ala Asn Leu Leu Asp Arg Ser
                965   970   975

Val Leu Tyr Arg Ile Met Asn Gln Glu Pro Gly Glu Ser Ser Phe Leu
            980   985   990

Asp Trp Ala Ser Asp Pro Tyr Ser Cys Asn Leu Pro Gln Ser Gln Asn
            995   1000   1005

Ile Thr Thr Met Ile Lys Asn Ile Thr Ala Arg Asn Val Leu Gln
    1010   1015   1020

Asp Ser Pro Asn Pro Leu Leu Ser Gly Leu Phe Thr Asn Thr Met
    1025   1030   1035

Ile Glu Glu Asp Glu Glu Leu Ala Glu Phe Leu Met Asp Arg Lys
    1040   1045   1050

62

Val Ile Leu Pro Arg Val Ala His Asp Ile Leu Asp Asn Ser Leu
1055   1060   1065

Thr Gly Ile Arg Asn Ala Ile Ala Gly Met Leu Asp Thr Thr Lys
1070   1075   1080

Ser Leu Ile Arg Val Gly Ile Asn Arg Gly Gly Leu Thr Tyr Ser
1085   1090   1095

Leu Leu Arg Lys Ile Ser Asn Tyr Asp Leu Val Gln Tyr Glu Thr
1100   1105   1110

Leu Ser Arg Thr Leu Arg Leu Ile Val Ser Asp Lys Ile Arg Tyr
1115   1120   1125

Glu Asp Met Cys Ser Val Asp Leu Ala Ile Ala Leu Arg Gln Lys
1130   1135   1140

Met Trp Ile His Leu Ser Gly Gly Arg Met Ile Ser Gly Leu Glu
1145   1150   1155

Thr Pro Asp Pro Leu Glu Leu Leu Ser Gly Val Ile Ile Thr Gly
1160   1165   1170

Ser Glu His Cys Lys Ile Cys Tyr Ser Ser Asp Gly Thr Asn Pro
1175   1180   1185

Tyr Thr Trp Met Tyr Leu Pro Gly Asn Ile Lys Ile Gly Ser Ala
1190   1195   1200

Glu Thr Gly Ile Ser Ser Leu Arg Val Pro Tyr Phe Gly Ser Val
1205   1210   1215

Thr Asp Glu Arg Ser Glu Ala Gln Leu Gly Tyr Ile Lys Asn Leu
1220   1225   1230

Ser Lys Pro Ala Lys Ala Ala Ile Arg Ile Ala Met Ile Tyr Thr
1235   1240   1245

Trp Ala Phe Gly Asn Asp Glu Ile Ser Trp Met Glu Ala Ser Gln
1250   1255   1260

Ile Ala Gln Thr Arg Ala Asn Phe Thr Leu Asp Ser Leu Lys Ile
1265   1270   1275

Leu Thr   Pro Val Ala Thr Ser   Thr Asn Leu Ser His Arg Leu Lys
    1280   1285   1290

Asp Thr   Ala Thr Gln Met Lys   Phe Ser Ser Thr Ser Leu Ile Arg
    1295   1300   1305

Val Ser   Arg Phe Ile Thr Met   Ser Asn Asp Asn Met Ser Ile Lys
    1310   1315   1320

Glu Ala   Asn Glu Thr Lys Asp   Thr Asn Leu Ile Tyr Gln Gln Ile
    1325   1330   1335

Met Leu   Thr Gly Leu Ser Val   Phe Glu Tyr Leu Phe Arg Leu Glu
    1340   1345   1350

Glu Thr   Thr Gly His Asn Pro   Ile Val Met His Leu His Ile Glu
    1355   1360   1365

Asp Glu   Cys Cys Ile Lys Glu   Ser Phe Asn Asp Glu His Ile Asn
    1370   1375   1380

Pro Glu   Ser Thr Leu Glu Leu   Ile Arg Tyr Pro Glu Ser Asn Glu
    1385   1390   1395

Phe Ile   Tyr Asp Lys Asp Pro   Leu Lys Asp Val Asp Leu Ser Lys
    1400   1405   1410

Leu Met   Val Ile Lys Asp His   Ser Tyr Thr Ile Asp Met Asn Tyr
    1415   1420   1425

Trp Asp   Asp Thr Asp Ile Ile   His Ala Ile Ser Ile Cys Thr Ala
    1430   1435   1440

Ile Thr   Ile Ala Asp Thr Met   Ser Gln Leu Asp Arg Asp Asn Leu
    1445   1450   1455

Lys Glu   Ile Ile Val Ile Ala   Asn Asp Asp Asp Ile Asn Ser Leu
    1460   1465   1470

Ile Thr   Glu Phe Leu Thr Leu   Asp Ile Leu Val Phe Leu Lys Thr
    1475   1480   1485

Phe Gly   Gly Leu Leu Val Asn   Gln Phe Ala Tyr Thr Leu Tyr Ser
    1490   1495   1500

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Leu Lys   Thr   Glu Gly Arg Asp   Leu Ile Trp Asp   Tyr Ile Met Arg
     1505                   1510                1515

Thr Leu   Arg   Asp Thr Ser His   Ser Ile Leu Lys   Val Leu Ser Asn
     1520                   1525                1530

Ala Leu   Ser   His Pro Lys Val   Phe Lys Arg Phe   Trp Asp Cys Gly
     1535                   1540                1545

Val Leu   Asn   Pro Ile Tyr Gly   Pro Asn Thr Ala   Ser Gln Asp Gln
     1550                   1555                1560

Ile Lys   Leu   Ala Leu Ser Ile   Cys Glu Tyr Ser   Leu Asp Leu Phe
     1565                   1570                1575

Met Arg   Glu   Trp Leu Asn Gly   Val Ser Leu Glu   Ile Tyr Ile Cys
     1580                   1585                1590

Asp Ser   Asp   Met Glu Val Ala   Asn Asp Arg Lys   Gln Ala Phe Ile
     1595                   1600                1605

Ser Arg   His   Leu Ser Phe Val   Cys Cys Leu Ala   Glu Ile Ala Ser
     1610                   1615                1620

Phe Gly   Pro   Asn Leu Leu Asn   Leu Thr Tyr Leu   Glu Arg Leu Asp
     1625                   1630                1635

Leu Leu   Lys   Gln Tyr Leu Glu   Leu Asn Ile Lys   Asp Asp Pro Thr
     1640                   1645                1650

Leu Lys   Tyr   Val Gln Ile Ser   Gly Leu Leu Ile   Lys Ser Phe Pro
     1655                   1660                1665

Ser Thr   Val   Thr Tyr Val Arg   Lys Thr Ala Ile   Lys Tyr Leu Arg
     1670                   1675                1680

Ile Arg   Gly   Ile Ser Pro Pro   Glu Val Ile Asp   Asp Trp Asp Pro
     1685                   1690                1695

Ile Glu   Asp   Glu Asn Met Leu   Asp Asn Ile Val   Lys Thr Ile Asn
     1700                   1705                1710

Asp Asn   Cys   Asn Lys Asp Asn   Lys Gly Asn Lys   Ile Asn Asn Phe
     1715                   1720                1725
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65

Trp Gly Leu Ala Leu Lys Asn Tyr Gln Val Leu Lys Ile Arg Ser
        1730   1735   1740

Ile Thr Ser Asp Ser Asp Asn Asn Asp Arg Ser Asp Ala Ser Thr
        1745   1750   1755

Gly Gly Leu Thr Leu Pro Gln Gly Gly Asn Tyr Leu Ser His Gln
        1760   1765   1770

Leu Arg Leu Phe Gly Ile Asn Ser Thr Ser Cys Leu Lys Ala Leu
        1775   1780   1785

Glu Leu Ser Gln Ile Leu Met Lys Glu Val Asn Lys Asp Gln Asp
        1790   1795   1800

Arg Leu Phe Leu Gly Glu Gly Ala Gly Ala Met Leu Ala Cys Tyr
        1805   1810   1815

Asp Ala Thr Leu Gly Pro Ala Val Asn Tyr Tyr Asn Ser Gly Leu
        1820   1825   1830

Asn Ile Thr Asp Val Ile Gly Gln Arg Glu Leu Lys Ile Phe Pro
        1835   1840   1845

Ser Glu Val Ser Leu Val Gly Lys Lys Leu Gly Asn Val Thr Gln
        1850   1855   1860

Ile Leu Asn Arg Val Lys Val Leu Phe Asn Gly Asn Pro Asn Ser
        1865   1870   1875

Thr Trp Ile Gly Asn Met Glu Cys Glu Thr Leu Ile Trp Ser Glu
        1880   1885   1890

Leu Asn Asp Lys Ser Ile Gly Leu Val His Cys Asp Met Glu Gly
        1895   1900   1905

Ala Ile Gly Lys Ser Glu Glu Thr Val Leu His Glu His Tyr Ser
        1910   1915   1920

Val Ile Arg Ile Thr Tyr Leu Ile Gly Asp Asp Asp Val Val Leu
        1925   1930   1935

Ile Ser Lys Ile Ile Pro Thr Ile Thr Pro Asn Trp Ser Arg Ile
        1940   1945   1950

66

Leu Tyr Leu Tyr Lys Leu Tyr Trp Lys Asp Val Ser Ile Ile Ser
1955 1960 1965

Leu Lys Thr Ser Asn Pro Ala Ser Thr Glu Leu Tyr Leu Ile Ser
1970 1975 1980

Lys Asp Ala Tyr Cys Thr Ile Met Glu Pro Ser Glu Val Val Leu
1985 1990 1995

Ser Lys Leu Lys Arg Leu Ser Leu Leu Glu Glu Asn Asn Leu Leu
2000 2005 2010

Lys Trp Ile Ile Leu Ser Lys Lys Lys Asn Asn Glu Trp Leu His
2015 2020 2025

His Glu Ile Lys Glu Gly Glu Arg Asp Tyr Gly Val Met Arg Pro
2030 2035 2040

Tyr His Met Ala Leu Gln Ile Phe Gly Phe Gln Ile Asn Leu Asn
2045 2050 2055

His Leu Ala Lys Glu Phe Leu Ser Thr Pro Asp Leu Thr Asn Ile
2060 2065 2070

Asn Asn Ile Ile Gln Ser Phe Gln Arg Thr Ile Lys Asp Val Leu
2075 2080 2085

Phe Glu Trp Ile Asn Ile Thr His Asp Gly Lys Arg His Lys Leu
2090 2095 2100

Gly Gly Arg Tyr Asn Ile Phe Pro Leu Lys Asn Lys Gly Lys Leu
2105 2110 2115

Arg Leu Leu Ser Arg Arg Leu Val Leu Ser Trp Ile Ser Leu Ser
2120 2125 2130

Leu Ser Thr Arg Leu Leu Thr Gly Arg Phe Pro Asp Glu Lys Phe
2135 2140 2145

Glu His Arg Ala Gln Thr Gly Tyr Val Ser Leu Pro Asp Thr Asp
2150 2155 2160

Leu Glu Ser Leu Lys Leu Leu Ser Lys Asn Thr Ile Lys Asn Tyr
2165 2170 2175

67

Arg Glu Cys Ile Gly Ser Ile Ser Tyr Trp Phe Leu Thr Lys Glu
    2180   2185   2190

Val Lys Ile Leu Met Lys Leu Ile Gly Gly Ala Lys Leu Leu Gly
    2195   2200   2205

Ile Pro Arg Gln Tyr Lys Glu Pro Glu Glu Gln Leu Leu Glu Asp
    2210   2215   2220

Tyr Asn Gln His Asp Glu Phe Asp Ile Asp
    2225   2230

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Met Asp Lys Gln Glu Ser Thr Gln Asn Ser Ser Asp Ile Leu Tyr Pro
1   5   10   15

Glu Cys His Leu Asn Ser Pro Ile Val Lys Ser Lys Ile Ala Gln Leu
              20   25   30

His Val Leu Leu Asp Ile Asn Gln Pro Tyr Asp Leu Lys Asp Asn Ser
          35   40   45

Ile Ile Asn Ile Thr Lys Tyr Lys Ile Arg Asn Gly Gly Leu Ser Pro
        50   55   60

Arg Gln Ile Lys Ile Arg Ser Leu Gly Lys Ile Leu Lys Gln Glu Ile
65   70   75   80

Lys Asp Ile Asp Arg Tyr Thr Phe Glu Pro Tyr Pro Ile Phe Ser Leu
                85   90   95

Glu Leu Leu Arg Leu Asp Ile Pro Glu Ile Cys Asp Lys Ile Arg Ser
                100   105   110

Ile Phe Ser Val Ser Asp Arg Leu Ile Arg Glu Leu Ser Ser Gly Phe
            115   120   125

Gln Glu Leu Trp Leu Asn Ile Leu Arg Gln Leu Gly Cys Val Glu Gly
    130   135   140

68

Lys Glu Gly Phe Asp Ser Leu Lys Asp Val Asp Ile Ile Pro Asp Ile
145   150   155   160

Thr Asp Lys Tyr Asn Lys Asn Thr Trp Tyr Arg Pro Phe Leu Thr Trp
              165   170   175

Phe Ser Ile Lys Tyr Asp Met Arg Trp Met Gln Lys Asn Lys Ser Gly
              180   185   190

Asn His Leu Asp Val Ser Asn Ser His Asn Phe Leu Asp Cys Lys Ser
              195   200   205

Tyr Ile Leu Ile Ile Tyr Arg Asp Leu Val Ile Ile Ile Asn Lys Leu
    210   215   220

Lys Leu Thr Gly Tyr Val Leu Thr Pro Glu Leu Val Leu Met Tyr Cys
225   230   235   240

Asp Val Val Glu Gly Arg Trp Asn Met Ser Ser Ala Gly Arg Leu Asp
              245   250   255

Lys Arg Ser Ser Lys Ile Thr Cys Lys Gly Glu Glu Leu Trp Glu Leu
              260   265   270

Ile Asp Ser Leu Phe Pro Asn Leu Gly Glu Asp Val Tyr Asn Ile Ile
              275   280   285

Ser Leu Leu Glu Pro Leu Ser Leu Ala Leu Ile Gln Leu Asp Asp Pro
    290   295   300

Val Thr Asn Leu Lys Gly Ala Phe Met Arg His Val Leu Thr Glu Leu
305   310   315   320

His Thr Ile Leu Ile Lys Asp Asn Ile Tyr Thr Asp Ser Glu Ala Asp
              325   330   335

Ser Ile Met Glu Ser Leu Ile Lys Ile Phe Arg Glu Thr Ser Ile Asp
              340   345   350

Glu Lys Ala Glu Ile Phe Ser Phe Phe Arg Thr Phe Gly His Pro Ser
    355   360   365

Leu Glu Ala Ile Thr Ala Ala Asp Lys Val Arg Thr His Met Tyr Ser
    370   375   380

69

Ser Lys Lys Ile Ile Leu Lys Thr Leu Tyr Glu Cys His Ala Ile Phe
385   390   395   400

Cys Ala Ile Ile Ile Asn Gly Tyr Arg Glu Arg His Gly Gly Gln Trp
          405   410   415

Pro Pro Cys Glu Phe Pro Asn His Val Cys Leu Glu Leu Lys Asn Ala
          420   425   430

Gln Gly Ser Asn Ser Ala Ile Ser Tyr Glu Cys Ala Val Asp Asn Tyr
          435   440   445

Ser Ser Phe Ile Gly Phe Lys Phe Leu Lys Phe Ile Glu Pro Gln Leu
     450   455   460

Asp Glu Asp Leu Thr Ile Tyr Met Lys Asp Lys Ala Leu Ser Pro Arg
465   470   475   480

Lys Ala Ala Trp Asp Ser Val Tyr Pro Asp Ser Asn Leu Tyr Tyr Lys
          485   490   495

Val Pro Glu Ser Glu Glu Thr Arg Arg Leu Ile Glu Val Phe Ile Asn
          500   505   510

Asp Asn Asn Phe Asn Pro Ala Asp Ile Ile Asn Tyr Val Glu Ser Gly
          515   520   525

Glu Trp Leu Asn Asp Asp Ser Phe Asn Ile Ser Tyr Ser Leu Lys Glu
     530   535   540

Lys Glu Ile Lys Gln Glu Gly Arg Leu Phe Ala Lys Met Thr Tyr Lys
545   550   555   560

Met Arg Ala Val Gln Val Leu Ala Glu Thr Leu Leu Ala Lys Gly Val
          565   570   575

Gly Glu Leu Phe Ser Glu Asn Gly Met Val Lys Gly Glu Ile Asp Leu
          580   585   590

Leu Lys Arg Leu Thr Thr Leu Ser Val Ser Gly Val Pro Arg Ser Asn
          595   600   605

Ser Val Tyr Asn Asn Pro Ile Leu His Glu Lys Leu Ile Lys Asn Met
     610   615   620

70

Asn Lys Cys Asn Ser Asn Gly Tyr Trp Asp Glu Arg Lys Lys Ser Lys
625   630   635   640

Asn Glu Phe Lys Ala Ala Asp Ser Ser Thr Glu Gly Tyr Glu Thr Leu
            645   650   655

Ser Cys Phe Leu Thr Thr Asp Leu Lys Lys Tyr Cys Leu Asn Trp Arg
            660   665   670

Phe Glu Ser Thr Ala Leu Phe Gly Gln Arg Cys Asn Glu Ile Phe Gly
            675   680   685

Phe Lys Thr Phe Phe Asn Trp Met His Pro Ile Leu Glu Lys Ser Thr
            690   695   700

Ile Tyr Val Gly Asp Pro Tyr Cys Pro Val Pro Asp Arg Met His Lys
705   710   715   720

Glu Leu Gln Asp His Asp Asp Thr Gly Ile Phe Ile His Asn Pro Arg
                725   730   735

Gly Gly Ile Glu Gly Tyr Cys Gln Lys Leu Trp Thr Leu Ile Ser Ile
            740   745   750

Ser Ala Ile His Leu Ala Ala Val Lys Val Gly Val Arg Val Ser Ala
            755   760   765

Met Val Gln Gly Asp Asn Gln Ala Ile Ala Val Thr Ser Arg Val Pro
    770   775   780

Val Thr Gln Thr Tyr Lys Gln Lys Lys Thr His Val Tyr Glu Glu Ile
785   790   795   800

Thr Arg Tyr Phe Gly Ala Leu Arg Glu Val Met Phe Asp Ile Gly His
            805   810   815

Glu Leu Lys Leu Asn Glu Thr Ile Ile Ser Ser Lys Met Phe Val Tyr
            820   825   830

Ser Lys Arg Ile Tyr Tyr Asp Gly Lys Ile Leu Pro Gln Cys Leu Lys
        835   840   845

Ala Leu Thr Arg Cys Val Phe Trp Ser Glu Thr Leu Val Asp Glu Asn
    850   855   860

71

Arg Ser Ala Cys Ser Asn Ile Ala Thr Ser Ile Ala Lys Ala Ile Glu
865   870   875   880

Asn Gly Tyr Ser Pro Ile Leu Gly Tyr Cys Ile Ala Leu Phe Lys Thr
                 885   890   895

Cys Gln Gln Val Cys Ile Ser Leu Gly Met Thr Ile Asn Pro Thr Ile
             900   905   910

Thr Ser Thr Ile Lys Asp Gln Tyr Phe Lys Gly Lys Asn Trp Leu Arg
             915   920   925

Cys Ala Ile Leu Ile Pro Ala Asn Ile Gly Gly Phe Asn Tyr Met Ser
         930   935   940

Thr Ala Arg Cys Phe Val Arg Asn Ile Gly Asp Pro Ala Val Ala Ala
945   950   955   960

Leu Ala Asp Leu Lys Arg Phe Ile Lys Ala Gly Leu Leu Asp Lys Gln
             965   970   975

Val Leu Tyr Arg Val Met Asn Gln Glu Pro Gly Asp Ser Ser Phe Leu
             980   985   990

Asp Trp Ala Ser Asp Pro Tyr Ser Cys Asn Leu Pro His Ser Gln Ser
         995   1000   1005

Ile Thr Thr Ile Ile Lys Asn Val Thr Ala Arg Ser Val Leu Gln
    1010   1015   1020

Glu Ser Pro Asn Pro Leu Leu Ser Gly Leu Phe Ser Glu Ser Ser
    1025   1030   1035

Ser Glu Glu Asp Leu Asn Leu Ala Ser Phe Leu Met Asp Arg Lys
    1040   1045   1050

Ala Ile Leu Pro Arg Val Ala His Glu Ile Leu Asp Asn Ser Leu
    1055   1060   1065

Thr Gly Val Arg Glu Ala Ile Ala Gly Met Leu Asp Thr Thr Lys
    1070   1075   1080

Ser Leu Val Arg Ala Ser Val Arg Arg Gly Gly Leu Ser Tyr Ser
    1085   1090   1095

72

Ile Leu Arg Arg Leu Ile Asn Tyr Asp Leu Leu Gln Tyr Glu Thr
1100   1105   1110

Leu Thr Arg Thr Leu Arg Lys Pro Val Lys Asp Asn Ile Glu Tyr
1115   1120   1125

Glu Tyr Met Cys Ser Val Glu Leu Ala Ile Gly Leu Arg Gln Lys
1130   1135   1140

Met Trp Phe His Leu Thr Tyr Gly Arg Pro Ile His Gly Leu Glu
1145   1150   1155

Thr Pro Asp Pro Leu Glu Leu Leu Arg Gly Ser Phe Ile Glu Gly
1160   1165   1170

Ser Glu Ile Cys Lys Phe Cys Arg Ser Glu Gly Asn Asn Pro Met
1175   1180   1185

Tyr Thr Trp Phe Tyr Leu Pro Asp Asn Ile Asp Leu Asp Thr Leu
1190   1195   1200

Ser Asn Gly Ser Pro Ala Ile Arg Ile Pro Tyr Phe Gly Ser Ala
1205   1210   1215

Thr Asp Glu Arg Ser Glu Ala Gln Leu Gly Tyr Val Lys Asn Leu
1220   1225   1230

Ser Lys Pro Ala Lys Ala Ala Ile Arg Ile Ala Met Val Tyr Thr
1235   1240   1245

Trp Ala Tyr Gly Thr Asp Glu Ile Ser Trp Met Glu Ala Ala Leu
1250   1255   1260

Ile Ala Gln Thr Arg Ala Asn Leu Ser Leu Glu Asn Leu Lys Leu
1265   1270   1275

Leu Thr Pro Val Ser Thr Ser Thr Asn Leu Ser His Arg Leu Arg
1280   1285   1290

Asp Thr Ala Thr Gln Met Lys Phe Ser Ser Ala Thr Leu Val Arg
1295   1300   1305

Ala Ser Arg Phe Ile Thr Ile Ser Asn Asp Asn Met Ala Leu Lys
1310   1315   1320

73

Glu Ala Gly Glu Ser Lys Asp Thr Asn Leu Val Tyr Gln Gln Ile
    1325   1330   1335

Met Leu Thr Gly Leu Ser Leu Phe Glu Phe Asn Met Arg Tyr Lys
    1340   1345   1350

Gln Gly Ser Leu Ser Lys Pro Met Ile Leu His Leu His Leu Asn
    1355   1360   1365

Asn Lys Cys Cys Ile Ile Glu Ser Pro Gln Glu Leu Asn Ile Pro
    1370   1375   1380

Pro Arg Ser Thr Leu Asp Leu Glu Ile Thr Gln Glu Asn Asn Lys
    1385   1390   1395

Leu Ile Tyr Asp Pro Asp Pro Leu Lys Asp Ile Asp Leu Glu Leu
    1400   1405   1410

Phe Ser Lys Val Arg Asp Val Val His Thr Ile Asp Met Asn Tyr
    1415   1420   1425

Trp Ser Asp Asp Glu Ile Ile Arg Ala Thr Ser Ile Cys Thr Ala
    1430   1435   1440

Met Thr Ile Ala Asp Thr Met Ser Gln Leu Asp Arg Asp Asn Leu
    1445   1450   1455

Lys Glu Met Ile Ala Leu Ile Asn Asp Asp Asp Ile Asn Ser Leu
    1460   1465   1470

Ile Thr Glu Phe Met Val Ile Asp Ile Pro Leu Phe Cys Ser Thr
    1475   1480   1485

Phe Gly Gly Ile Leu Ile Asn Gln Phe Ala Tyr Ser Leu Tyr Gly
    1490   1495   1500

Leu Asn Val Arg Gly Arg Asp Glu Ile Trp Gly Tyr Val Ile Arg
    1505   1510   1515

Ile Ile Lys Asp Thr Ser His Ala Val Leu Lys Val Leu Ser Asn
    1520   1525   1530

Ala Leu Ser His Pro Lys Ile Phe Lys Arg Phe Trp Asp Ala Gly
    1535   1540   1545

74

Val Val Glu Pro Val Tyr Gly Pro Asn Leu Ser Asn Gln Asp Lys
1550   1555   1560

Ile Leu Leu Ala Ile Ser Val Cys Glu Tyr Ser Val Asp Leu Phe
1565   1570   1575

Met Arg Asp Trp Gln Glu Gly Ile Pro Leu Glu Ile Phe Ile Cys
1580   1585   1590

Asp Asn Asp Pro Asn Ile Ala Glu Met Arg Lys Leu Ser Phe Leu
1595   1600   1605

Ala Arg His Leu Ala Tyr Leu Cys Ser Leu Ala Glu Ile Ala Lys
1610   1615   1620

Glu Gly Pro Lys Leu Glu Ser Met Thr Ser Leu Glu Arg Leu Glu
1625   1630   1635

Ser Leu Lys Glu Tyr Leu Glu Leu Thr Phe Leu Asp Asp Pro Ile
1640   1645   1650

Leu Arg Tyr Ser Gln Leu Thr Gly Leu Val Ile Lys Ile Phe Pro
1655   1660   1665

Ser Thr Leu Thr Tyr Ile Arg Lys Ser Ser Ile Lys Val Leu Arg
1670   1675   1680

Val Arg Gly Ile Gly Ile Pro Glu Val Leu Glu Asp Trp Asp Pro
1685   1690   1695

Asp Ala Asp Ser Met Leu Leu Asp Asn Ile Thr Ala Glu Val Gln
1700   1705   1710

His Asn Ile Pro Leu Lys Lys Asn Glu Arg Thr Pro Phe Trp Gly
1715   1720   1725

Leu Arg Val Ser Lys Ser Gln Val Leu Arg Leu Arg Gly Tyr Glu
1730   1735   1740

Glu Ile Lys Arg Glu Glu Arg Gly Arg Ser Gly Val Gly Leu Thr
1745   1750   1755

Leu Pro Phe Asp Gly Arg Tyr Leu Ser His Gln Leu Arg Leu Phe
1760   1765   1770

75

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Gly Ile  Asn Ser Thr Ser Cys  Leu Lys Ala Leu  Glu  Leu Thr Tyr
    1775                1780               1785

Leu Leu  Asn Pro Leu Val Asn  Lys Asp Lys Asp  Arg  Leu Tyr Leu
    1790                1795               1800

Gly Glu  Gly Ala Gly Ala Met  Leu Ser Cys Tyr  Asp  Ala Thr Leu
    1805                1810               1815

Gly Pro  Cys Met Asn Tyr Tyr  Asn Ser Gly Val  Asn  Ser Cys Asp
    1820                1825               1830

Leu Asn  Gly Gln Arg Glu Leu  Asn Ile Tyr Pro  Ser  Glu Val Ala
    1835                1840               1845

Leu Val  Gly Lys Lys Leu Asn  Asn Val Thr Ser  Leu  Cys Gln Arg
    1850                1855               1860

Val Lys  Val Leu Phe Asn Gly  Asn Pro Gly Ser  Thr  Trp Ile Gly
    1865                1870               1875

Asn Asp  Glu Cys Glu Thr Leu  Ile Trp Asn Glu  Leu  Gln Asn Asn
    1880                1885               1890

Ser Ile  Gly Phe Ile His Cys  Asp Met Glu Gly  Gly  Glu His Lys
    1895                1900               1905

Cys Asp  Gln Val Val Leu His  Glu His Tyr Ser  Val  Ile Arg Ile
    1910                1915               1920

Ala Tyr  Leu Val Gly Asp Lys  Asp Val Ile Leu  Val  Ser Lys Ile
    1925                1930                1935

Ala Pro  Arg Leu Gly Thr Asp  Trp Thr Lys Gln  Leu  Ser Leu Tyr
    1940                1945               1950

Leu Arg  Tyr Trp Arg Asp Val  Ser Leu Ile Val  Leu  Lys Thr Ser
    1955                1960               1965

Asn Pro  Ala Ser Thr Glu Met  Tyr Leu Ile Ser  Lys  Asp Pro Lys
    1970                1975               1980

Ser Asp  Ile Ile Glu Asp Ser  Asn Thr Val Leu  Ala  Asn Leu Leu
    1985                1990               1995

                            76
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Pro Leu Ser Lys Glu Asp Ser Ile Lys Ile Glu Lys Trp Ile Leu
2000   2005   2010

Val Glu Lys Ala Lys Val His Asp Trp Ile Val Arg Glu Leu Lys
2015   2020   2025

Glu Gly Ser Ala Ser Ser Gly Met Leu Arg Pro Tyr His Gln Ala
2030   2035   2040

Leu Gln Ile Phe Gly Phe Glu Pro Asn Leu Asn Lys Leu Cys Arg
2045   2050   2055

Asp Phe Leu Ser Thr Leu Asn Ile Val Asp Thr Lys Asn Cys Ile
2060   2065   2070

Ile Thr Phe Asp Arg Val Leu Arg Asp Thr Ile Phe Glu Trp Thr
2075   2080   2085

Arg Ile Lys Asp Ala Asp Lys Lys Leu Arg Leu Thr Gly Lys Tyr
2090   2095   2100

Asp Leu Tyr Pro Leu Arg Asp Ser Gly Lys Leu Lys Val Ile Ser
2105   2110   2115

Arg Arg Leu Val Ile Ser Trp Ile Ala Leu Ser Met Ser Thr Arg
2120   2125   2130

Leu Val Thr Gly Ser Phe Pro Asp Ile Lys Phe Glu Ser Arg Leu
2135   2140   2145

Gln Leu Gly Ile Val Ser Ile Ser Ser Arg Glu Ile Lys Asn Leu
2150   2155   2160

Arg Val Ile Ser Lys Ile Val Ile Asp Lys Phe Glu Asp Ile Ile
2165   2170   2175

His Ser Val Thr Tyr Arg Phe Leu Thr Lys Glu Ile Lys Ile Leu
2180   2185   2190

Met Lys Ile Leu Gly Ala Val Lys Leu Phe Gly Ala Arg Gln Ser
2195   2200   2205

Thr Ser Ala Asp Ile Thr Asn Ile Asp Thr Ser Asp Ser Ile Gln
2210   2215   2220

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<211> 2233
<212> PRT
<213> bovine parainfluenza virus 3

<400> 16

Met Asp Thr Glu Ser His Ser Gly Thr Thr Ser Asp Ile Leu Tyr Pro
1   5   10   15

Glu Cys His Leu Asn Ser Pro Ile Val Lys Gly Lys Ile Ala Gln Leu
            20   25   30

His Thr Ile Met Ser Leu Pro Gln Pro Tyr Asp Met Asp Asp Asp Ser
        35   40   45

Ile Leu Ile Ile Thr Arg Gln Lys Ile Lys Leu Asn Lys Leu Asp Lys
        50   55   60

Arg Gln Arg Ser Ile Arg Lys Leu Arg Ser Val Leu Met Glu Arg Val
65   70   75   80

Ser Asp Leu Gly Lys Tyr Thr Phe Ile Arg Tyr Pro Glu Met Ser Ser
            85   90   95

Glu Met Phe Gln Leu Cys Ile Pro Gly Ile Asn Asn Lys Ile Asn Glu
            100   105   110

Leu Leu Ser Lys Ala Ser Lys Thr Tyr Asn Gln Met Thr Asp Gly Leu
            115   120   125

Arg Asp Leu Trp Val Thr Ile Leu Ser Lys Leu Ala Ser Lys Asn Asp
        130   135   140

Gly Ser Asn Tyr Asp Ile Asn Glu Asp Ile Ser Asn Ile Ser Asn Val
145   150   155   160

His Met Thr Tyr Gln Ser Asp Lys Trp Tyr Asn Pro Phe Lys Thr Trp
            165   170   175

Phe Thr Ile Lys Tyr Asp Met Arg Arg Leu Gln Lys Ala Lys Asn Glu
            180   185   190

Ile Thr Phe Asn Arg His Lys Asp Tyr Asn Leu Leu Glu Asp Gln Lys
        195   200   205

78

Asn Ile Leu Leu Ile His Pro Glu Leu Val Leu Ile Leu Asp Lys Gln
210   215   220

Asn Tyr Asn Gly Tyr Ile Met Thr Pro Glu Leu Val Leu Met Tyr Cys
225   230   235   240

Asp Val Val Glu Gly Arg Trp Asn Ile Ser Ser Cys Ala Lys Leu Asp
            245   250   255

Pro Lys Leu Gln Ser Met Tyr Tyr Lys Gly Asn Asn Leu Trp Glu Ile
            260   265   270

Ile Asp Gly Leu Phe Ser Thr Leu Gly Glu Arg Thr Phe Asp Ile Ile
        275   280   285

Ser Leu Leu Glu Pro Leu Ala Leu Ser Leu Ile Gln Thr Tyr Asp Pro
    290   295   300

Val Lys Gln Leu Arg Gly Ala Phe Leu Asn His Val Leu Ser Glu Met
305   310   315   320

Glu Leu Ile Phe Ala Ala Glu Cys Thr Thr Glu Glu Ile Pro Asn Val
            325   330   335

Asp Tyr Ile Asp Lys Ile Leu Asp Val Phe Lys Glu Ser Thr Ile Asp
        340   345   350

Glu Ile Ala Glu Ile Phe Ser Phe Phe Arg Thr Phe Gly His Pro Pro
        355   360   365

Leu Glu Ala Ser Ile Ala Ala Glu Lys Val Arg Lys Tyr Met Tyr Thr
370   375   380

Glu Lys Cys Leu Lys Phe Asp Thr Ile Asn Lys Cys His Ala Ile Phe
385   390   395   400

Cys Thr Ile Ile Ile Asn Gly Tyr Arg Glu Arg His Gly Gly Gln Trp
            405   410   415

Pro Pro Val Thr Leu Pro Val His Ala His Glu Phe Ile Ile Asn Ala
            420   425   430

Tyr Gly Ser Asn Ser Ala Ile Ser Tyr Glu Asn Ala Val Asp Tyr Tyr
    435   440   445

79

Lys Ser Phe Ile Gly Ile Lys Phe Asp Lys Phe Ile Glu Pro Gln Leu
450   455   460

Asp Glu Asp Leu Thr Ile Tyr Met Lys Asp Lys Ala Leu Ser Pro Lys
465   470   475   480

Lys Ser Asn Trp Asp Thr Val Tyr Pro Ala Ser Asn Leu Leu Tyr Arg
                485   490   495

Thr Asn Val Ser His Asp Ser Arg Arg Leu Val Glu Val Phe Ile Ala
                500   505   510

Asp Ser Lys Phe Asp Pro His Gln Val Leu Asp Tyr Val Glu Ser Gly
            515   520   525

Tyr Trp Leu Asp Asp Pro Glu Phe Asn Ile Ser Tyr Ser Leu Lys Glu
    530   535   540

Lys Glu Ile Lys Gln Glu Gly Arg Leu Phe Ala Lys Met Thr Tyr Lys
545   550   555   560

Met Arg Ala Thr Gln Val Leu Ser Glu Thr Leu Leu Ala Asn Asn Ile
                565   570   575

Gly Lys Phe Phe Gln Glu Asn Gly Met Val Lys Gly Glu Ile Glu Leu
                580   585   590

Leu Lys Arg Leu Thr Thr Ile Ser Met Ser Gly Val Pro Arg Tyr Asn
        595   600   605

Glu Val Tyr Asn Asn Ser Lys Ser His Thr Glu Glu Leu Gln Ala Tyr
    610   615   620

Asn Ala Ile Ser Ser Ser Asn Leu Ser Ser Asn Gln Lys Ser Lys Lys
625   630   635   640

Phe Glu Phe Lys Ser Thr Asp Ile Tyr Asn Asp Gly Tyr Glu Thr Val
            645   650   655

Ser Cys Phe Leu Thr Thr Asp Leu Lys Lys Tyr Cys Leu Asn Trp Arg
            660   665   670

Tyr Glu Ser Thr Ala Leu Phe Gly Asp Thr Cys Asn Gln Ile Phe Gly
    675   680   685

80

Leu Lys Glu Leu Phe Asn Trp Leu His Pro Arg Leu Glu Lys Ser Thr
    690   695   700

Ile Tyr Val Gly Asp Pro Tyr Cys Pro Pro Ser Asp Ile Glu His Leu
705   710   715   720

Pro Leu Asp Asp His Pro Asp Ser Gly Phe Tyr Val His Asn Pro Lys
            725   730   735

Gly Gly Ile Glu Gly Phe Cys Gln Lys Leu Trp Thr Leu Ile Ser Ile
            740   745   750

Ser Ala Ile His Leu Ala Ala Val Lys Ile Gly Val Arg Val Thr Ala
            755   760   765

Met Val Gln Gly Asp Asn Gln Ala Ile Ala Val Thr Thr Arg Val Pro
    770   775   780

Asn Asn Tyr Asp Tyr Lys Val Lys Lys Glu Ile Val Tyr Lys Asp Val
785   790   795   800

Val Arg Phe Phe Asp Ser Leu Arg Glu Val Met Asp Asp Leu Gly His
            805   810   815

Glu Leu Lys Leu Asn Glu Thr Ile Ile Ser Ser Lys Met Phe Ile Tyr
            820   825   830

Ser Lys Arg Ile Tyr Tyr Asp Gly Arg Ile Leu Pro Gln Ala Leu Lys
            835   840   845

Ala Leu Ser Arg Cys Val Phe Trp Ser Glu Thr Ile Ile Asp Glu Thr
    850   855   860

Arg Ser Ala Ser Ser Asn Leu Ala Thr Ser Phe Ala Lys Ala Ile Glu
865   870   875   880

Asn Gly Tyr Ser Pro Val Leu Gly Tyr Val Cys Ser Ile Phe Lys Asn
            885   890   895

Ile Gln Gln Leu Tyr Ile Ala Leu Gly Met Asn Ile Asn Pro Thr Ile
            900   905   910

Thr Gln Asn Ile Lys Asp Gln Tyr Phe Arg Asn Ile His Trp Met Gln
            915   920   925

81

Tyr Ala Ser Leu Ile Pro Ala Ser Val Gly Gly Phe Asn Tyr Met Ala
930   935   940

Met Ser Arg Cys Phe Val Arg Asn Ile Gly Asp Pro Thr Val Ala Ala
945   950   955   960

Leu Ala Asp Ile Lys Arg Phe Ile Lys Ala Asn Leu Leu Asp Arg Gly
965   970   975

Val Leu Tyr Arg Ile Met Asn Gln Glu Pro Gly Glu Ser Ser Phe Leu
980   985   990

Asp Trp Ala Ser Asp Pro Tyr Ser Cys Asn Leu Pro Gln Ser Gln Asn
995   1000   1005

Ile Thr Thr Met Ile Lys Asn Ile Thr Ala Arg Asn Val Leu Gln
1010   1015   1020

Asp Ser Pro Asn Pro Leu Leu Ser Gly Leu Phe Thr Ser Thr Met
1025   1030   1035

Ile Glu Glu Asp Glu Glu Leu Ala Glu Phe Leu Met Asp Arg Arg
1040   1045   1050

Ile Ile Leu Pro Arg Val Ala His Asp Ile Leu Asp Asn Ser Leu
1055   1060   1065

Thr Gly Ile Arg Asn Ala Ile Ala Gly Met Leu Asp Thr Thr Lys
1070   1075   1080

Ser Leu Ile Arg Val Gly Ile Ser Arg Gly Gly Leu Thr Tyr Asn
1085   1090   1095

Leu Leu Arg Lys Ile Ser Asn Tyr Asp Leu Val Gln Tyr Glu Thr
1100   1105   1110

Leu Ser Lys Thr Leu Arg Leu Ile Val Ser Asp Lys Ile Lys Tyr
1115   1120   1125

Glu Asp Met Cys Ser Val Asp Leu Ala Ile Ser Leu Arg Gln Lys
1130   1135   1140

Met Trp Met His Leu Ser Gly Gly Arg Met Ile Asn Gly Leu Glu
1145   1150   1155

82

Thr Pro Asp Pro Leu Glu Leu Leu Ser Gly Val Ile Ile Thr Gly
    1160   1165   1170

Ser Glu His Cys Arg Ile Cys Tyr Ser Thr Glu Gly Glu Ser Pro
    1175   1180   1185

Tyr Thr Trp Met Tyr Leu Pro Gly Asn Leu Asn Ile Gly Ser Ala
    1190   1195   1200

Glu Thr Gly Ile Ala Ser Leu Arg Val Pro Tyr Phe Gly Ser Val
    1205   1210   1215

Thr Asp Glu Arg Ser Glu Ala Gln Leu Gly Tyr Ile Lys Asn Leu
    1220   1225   1230

Ser Lys Pro Ala Lys Ala Ala Ile Arg Ile Ala Met Ile Tyr Thr
    1235   1240   1245

Trp Ala Phe Gly Asn Asp Glu Ile Ser Trp Met Glu Ala Ser Gln
    1250   1255   1260

Ile Ala Gln Thr Arg Ala Asn Phe Thr Leu Asp Ser Leu Lys Ile
    1265   1270   1275

Leu Thr Pro Val Thr Thr Ser Thr Asn Leu Ser His Arg Leu Lys
    1280   1285   1290

Asp Thr Ala Thr Gln Met Lys Phe Ser Ser Thr Ser Leu Ile Arg
    1295   1300   1305

Val Ser Arg Phe Ile Thr Ile Ser Asn Asp Asn Met Ser Ile Lys
    1310   1315   1320

Glu Ala Asn Glu Thr Lys Asp Thr Asn Leu Ile Tyr Gln Gln Val
    1325   1330   1335

Met Leu Thr Gly Leu Ser Val Phe Glu Tyr Leu Phe Arg Leu Glu
    1340   1345   1350

Glu Ser Thr Gly His Asn Pro Met Val Met His Leu His Ile Glu
    1355   1360   1365

Asp Gly Cys Cys Ile Lys Glu Ser Tyr Asn Asp Glu His Ile Asn
    1370   1375   1380

83

Pro Glu Ser Thr Leu Glu Leu Ile Lys Tyr Pro Glu Ser Asn Glu
1385   1390   1395

Phe Ile Tyr Asp Lys Asp Pro Leu Lys Asp Ile Asp Leu Ser Lys
1400   1405   1410

Leu Met Val Ile Arg Asp His Ser Tyr Thr Ile Asp Met Asn Tyr
1415   1420   1425

Trp Asp Asp Thr Asp Ile Val His Ala Ile Ser Ile Cys Thr Ala
1430   1435   1440

Val Thr Ile Ala Asp Thr Met Ser Gln Leu Asp Arg Asp Asn Leu
1445   1450   1455

Lys Glu Leu Val Val Ile Ala Asn Asp Asp Asp Ile Asn Ser Leu
1460   1465   1470

Ile Thr Glu Phe Leu Thr Leu Asp Ile Leu Val Phe Leu Lys Thr
1475   1480   1485

Phe Gly Gly Leu Leu Val Asn Gln Phe Ala Tyr Thr Leu Tyr Gly
1490   1495   1500

Leu Lys Ile Glu Gly Arg Asp Pro Ile Trp Asp Tyr Ile Met Arg
1505   1510   1515

Thr Leu Lys Asp Thr Ser His Ser Val Leu Lys Val Leu Ser Asn
1520   1525   1530

Ala Leu Ser His Pro Lys Val Phe Lys Arg Phe Trp Asp Cys Gly
1535   1540   1545

Val Leu Asn Pro Ile Tyr Gly Pro Asn Thr Ala Ser Gln Asp Gln
1550   1555   1560

Val Lys Leu Ala Leu Ser Ile Cys Glu Tyr Ser Leu Asp Leu Phe
1565   1570   1575

Met Arg Glu Trp Leu Asn Gly Ala Ser Leu Glu Ile Tyr Ile Cys
1580   1585   1590

Asp Ser Asp Met Glu Ile Ala Asn Asp Arg Arg Gln Ala Phe Leu
1595   1600   1605

84

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Ser Arg  His Leu Ala Phe Val  Cys Cys Leu Ala Glu  Ile Ala Ser
    1610               1615               1620

Phe Gly  Pro Asn Leu Leu Asn  Leu Thr Tyr Leu Glu  Arg Leu Asp
    1625               1630               1635

Glu Leu  Lys Gln Tyr Leu Asp  Leu Asn Ile Lys Glu  Asp Pro Thr
    1640               1645               1650

Leu Lys  Tyr Val Gln Val Ser  Gly Leu Leu Ile Lys  Ser Phe Pro
    1655               1660               1665

Ser Thr  Val Thr Tyr Val Arg  Lys Thr Ala Ile Lys  Tyr Leu Arg
    1670               1675               1680

Ile Arg  Gly Ile Asn Pro Pro  Glu Thr Ile Glu Asp  Trp Asp Pro
    1685               1690               1695

Ile Glu  Asp Glu Asn Ile Leu  Asp Asn Ile Val Lys  Thr Val Asn
    1700               1705               1710

Asp Asn  Cys Ser Asp Asn Gln  Lys Arg Asn Lys Ser  Ser Tyr Phe
    1715               1720               1725

Trp Gly  Leu Ala Leu Lys Asn  Tyr Gln Val Val Lys  Ile Arg Ser
    1730               1735               1740

Ile Thr  Ser Asp Ser Glu Val  Asn Glu Ala Ser Asn  Val Thr Thr
    1745               1750               1755

His Gly  Met Thr Leu Pro Gln  Gly Gly Ser Tyr Leu  Ser His Gln
    1760               1765               1770

Leu Arg  Leu Phe Gly Val Asn  Ser Thr Ser Cys Leu  Lys Ala Leu
    1775               1780               1785

Glu Leu  Ser Gln Ile Leu Met  Arg Glu Val Lys Lys  Asp Lys Asp
    1790               1795               1800

Arg Leu  Phe Leu Gly Glu Gly  Ala Gly Ala Met Leu  Ala Cys Tyr
    1805               1810               1815

Asp Ala  Thr Leu Gly Pro Ala  Ile Asn Tyr Tyr Asn  Ser Gly Leu
    1820               1825               1830
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85

Asn Ile Thr Asp Val Ile Gly Gln Arg Glu Leu Lys Ile Phe Pro
1835   1840   1845

Ser Glu Val Ser Leu Val Gly Lys Lys Leu Gly Asn Val Thr Gln
1850   1855   1860

Ile Leu Asn Arg Val Arg Val Leu Phe Asn Gly Asn Pro Asn Ser
1865   1870   1875

Thr Trp Ile Gly Asn Met Glu Cys Glu Ser Leu Ile Trp Ser Glu
1880   1885   1890

Leu Asn Asp Lys Ser Ile Gly Leu Val His Cys Asp Met Glu Gly
1895   1900   1905

Ala Ile Gly Lys Ser Glu Glu Thr Val Leu His Glu His Tyr Ser
1910   1915   1920

Ile Ile Arg Ile Thr Tyr Leu Ile Gly Asp Asp Asp Val Val Leu
1925   1930   1935

Val Ser Lys Ile Ile Pro Thr Ile Thr Pro Asn Trp Ser Lys Ile
1940   1945   1950

Leu Tyr Leu Tyr Lys Leu Tyr Trp Lys Asp Val Ser Val Val Ser
1955   1960   1965

Leu Lys Thr Ser Asn Pro Ala Ser Thr Glu Leu Tyr Leu Ile Ser
1970   1975   1980

Lys Asp Ala Tyr Cys Thr Val Met Glu Pro Ser Asn Leu Val Leu
1985   1990   1995

Ser Lys Leu Lys Arg Ile Ser Ser Ile Glu Glu Asn Asn Leu Leu
2000   2005   2010

Lys Trp Ile Ile Leu Ser Lys Arg Lys Asn Asn Glu Trp Leu Gln
2015   2020   2025

His Glu Ile Lys Glu Gly Glu Arg Asp Tyr Gly Ile Met Arg Pro
2030   2035   2040

Tyr His Thr Ala Leu Gln Ile Phe Gly Phe Gln Ile Asn Leu Asn
2045   2050   2055

His Leu Ala Arg Glu Phe Leu Ser Thr Pro Asp Leu Thr Asn Ile
2060   2065   2070

Asn Asn Ile Ile Gln Ser Phe Thr Arg Thr Ile Lys Asp Val Met
2075   2080   2085

Phe Glu Trp Val Asn Ile Thr His Asp Asn Lys Arg His Lys Leu
2090   2095   2100

Gly Gly Arg Tyr Asn Leu Phe Pro Leu Lys Asn Lys Gly Lys Leu
2105   2110   2115

Arg Leu Leu Ser Arg Arg Leu Val Leu Ser Trp Ile Ser Leu Ser
2120   2125   2130

Leu Ser Thr Arg Leu Leu Thr Gly Arg Phe Pro Asp Glu Lys Phe
2135   2140   2145

Glu Asn Arg Ala Gln Thr Gly Tyr Val Ser Leu Ala Asp Ile Asp
2150   2155   2160

Leu Glu Ser Leu Lys Leu Leu Ser Arg Asn Ile Val Lys Asn Tyr
2165   2170   2175

Lys Glu His Ile Gly Leu Ile Ser Tyr Trp Phe Leu Thr Lys Glu
2180   2185   2190

Val Lys Ile Leu Met Lys Leu Ile Gly Gly Val Lys Leu Leu Gly
2195   2200   2205

Ile Pro Lys Gln Tyr Lys Glu Leu Glu Asp Arg Ser Ser Gln Gly
2210   2215   2220

Tyr Glu Tyr Asp Asn Glu Phe Asp Ile Asp
2225   2230

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87

<213> human metapneumovirus

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ugcucuuuuu uugcguaagu ucguccaaga ucuuuuuauu accc   44

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<400> 21
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<210> 22
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<213> human metapneumovirus

<400> 22
acggcaaaaa aaccguauac auucaauuau aauuucuuau uuuua   45

<210> 23
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<400> 23
acgagaaaaa aaccguauuc aucaaauuuu uagcuuuuag uuuuu   45

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<210> 26
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<213> Artificial Sequence

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      assignments.

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<210> 27
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> HMPV strain 83 gene start consensus sequence with alternative
      assignments.

<400> 27
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<210> 28
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<213> Artificial Sequence

<220>
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<400> 28
ttagttaatt aaaaata   17

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<212> DNA
<213> Artificial Sequence

<220>
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      assignments.

<400> 29

89

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<210> 30
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<212> DNA
<213> Artificial Sequence

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<223> HMPV strain 83 gene end consensus sequence with alternative
      assignments.

<400> 30
gaagttagct aaaaagt
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<210> 31
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<212> DNA
<213> human respiratory syncytial virus

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<210> 32
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<400> 32
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                                                                        17

<210> 33
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<223> Synthetic oligonucleotide.

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<400>   34
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gatgtgggta caacaactgc agtgacaccc tcatcattgc aacaagaaat aacactgttg     180
tgtggagaaa ttctgtatgc taaacatgct gactacaaat atgctgcaga aataggaata     240
caatatatta gcacagcttt aggatcagag agagtgcagc agattctgag gaactcaggc     300
agtgaagtcc aagtggtctt aaccagaacg tactctctgg ggaaaattaa aaacaataaa     360
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92

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93

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94

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95

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96

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97

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